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BULLETIN No. 55

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VIRGINIA DEPARTMENT OF AGRICULTURE AND IMMIGRATION

ANNUAL REPORT OF THE COMMISSIONER AND STATE BOARD OF AGRICULTURE AND IMMIGRATION

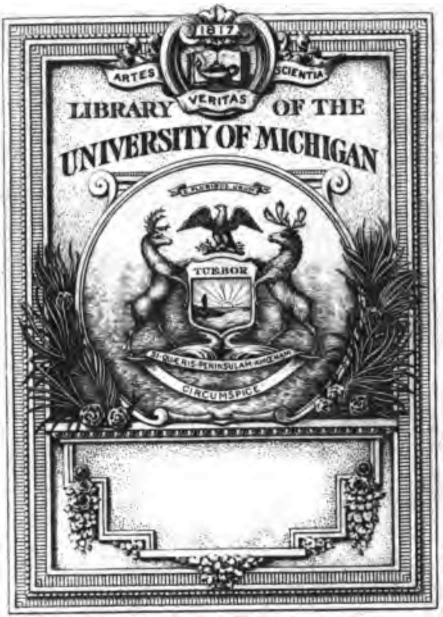
WHAT THE VIRGINIA FARMERS ARE DOING

Land products in 1900
$129,000,000.00
Total acreage, 4,030,300

Land products in 1910
$236,000,000.00
Total acreage, 3,350,000

GEO. W. KOINER
COMMISSIONER
RICHMOND, VA.
1910

Entered at Richmond Post Office as second class matter



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DEPARTMENT OF AGRICULTURE
AND IMMIGRATION
OF VIRGINIA

The Annual Report of the Commissioner and the Board of Agriculture and Immigration

1910

RICHMOND:
EVERETT WADDEY COMPANY
1910

Department of Agriculture and Immigration of the State of Virginia.

STATE BOARD OF AGRICULTURE AND IMMIGRATION.

MEMBERS	DISTRICT	P. O. ADDRESS
N. W. NOCK	First congressional district	Onancock
A. O. MAUCK	Second congressional district	Norfolk
JNO. S. TAYLOR	Third congressional district	Beach
J. T. ARVIN	Fourth congressional district	Double Bridge
J. M. BARKER	Fifth congressional district	Axton
B. D. ADAMS	Sixth congressional district	Red Oak
J. JAMES MILLER	Seventh congressional district	Hawlin
W. H. EGGBORN	Eighth congressional district	Eggbornville
JAMES R. GOODWIN	Ninth congressional district	Eggleston
W. W. SPROUL	Tenth congressional district	Middlebrook
P. B. BARRINGER	President V. P. I. (*ex-officio*)	Blacksburg

OFFICERS OF THE BOARD.

President	J. M. BARKER	Axton, Va.
Secretary	B. D. ADAMS	Red Oak, Va.

OFFICERS AND EMPLOYEES OF THE DEPARTMENT.

Commissioner of Agriculture	G. W. KOINER
Chief Clerk	C. A. MILLER
Fertilizer Clerk	J. W. WILLIAMS
Financial Clerk	L. T. BERRY
Institute Director	J. J. OWEN
Seed Analyst	J. E. BENEDICT, Jr.
Stenographer	O. M. RICHARDSON
Stenographer	L. G. COUSINS
Messenger	C. E. FRENCH

LABORATORY.

Chief Chemist	E. W. MAGRUDER
Assistant Chemist	C. M. BRADBURY
Chemist	J. B. ROBB
Chemist	H. L. DAVIDSON
Chemist	J. H. PARKINS
Messenger	J. D. CLARK

FERTILIZER INSPECTORS.

First District	J. H. READ
Second District	J. C. CODD
Third District	J. A. LESTER
Fourth District	A. B. ARVIN
Fifth District	A. L. MOORE
Sixth District	W. W. WARD
Seventh District	D. B. PARROTT
Eighth District	T. G. TATE
Ninth District	McK. MONTAGUE
Tenth District	J. H. LEECH

President's Letter of Transmittal.

AXTON, VA., *November 15, 1910.*

To His Excellency, WILLIAM HODGES MANN,
Governor of Virginia:

I herewith submit the annual report of the Commissioner of Agriculture. It gives me pleasure to say that the work of this department has been of great help to the farmers of the State. An evidence of this fact is that the farmers generally are doing better farming than ever before in the history of the State. Farmers' institutes have been held in different parts of the State, and the success of these institutes has been extremely gratifying. One of the best evidences of this is the frequent requests for another institute where one has been held.

There are several experiment stations, established by this department, in the State that are doing good work, and the farmers are taking much interest in them. You have noticed that some farmers made, the present year, more than 160 bushels of corn to one acre. I predict that in the next ten years the average corn crop of this State will be at least thirty-five bushels to the acre. There is also a great improvement in grasses and live stock throughout the State.

In conclusion, I must say that the employees of this department deserve great credit for the faithful discharge of their duties of the department.

Respectfully,
J. M. BARKER,
President Board of Agriculture.

Annual Report

OF

G. W. Koiner, Commissioner of Agriculture.

It is a great pleasure to note the continued improvement in the agricultural conditions in this State during the past year.

THE SPIRIT OF BETTER FARMING.

The spirit of better farming pervades the whole State. The improvements from the first efforts in previous years have stimulated every farmer, who has made these efforts for better farming to strive harder and more persistently to advance still farther in his upward march in better farming. The increased average yield from year to year in the general crops of the State proves this.

YIELD OF CROPS LARGER.

The value of these crops in the State has risen from $129,000,000.00 to more than $200,000,000.00, and yet there is room for still greater improvement.

FARMING, THE MOST INSPIRING BUSINESS.

Good farming is the most inspiring business in the world, for, notwithstanding the large yields of crops that have been made, there is room for still larger yields. No man has ever yet ascertained the utmost limit in the producing capacity of an acre of ground. The Department of Agriculture has been busy during the year in giving every encouragement and aid to our farmers, possible within its power and means.

LITERATURE FOR THE FARMERS.

The requests from farmers for literature have taxed the means of the Department to supply them. 70,000 copies of the Annual Report were distributed this year, as well as other bulletins.

A NEW BULLETIN ON GROWING ALFALFA.

A bulletin on how to grow alfalfa in Virginia has been distributed to all farmers who are interested in learning how to grow this the most profitable crop that the farmer can grow. It has been said that alfalfa has made Kansas more business than any crop ever grown in that State, and it will do the same for Virginia when our farmers have learned how to grow it generally over the State. The great success that has been made on one farm in King George county proves this assertion, where 400 acres in luxuriant alfalfa have produced a hay crop this year that is worth $35,000.00 and grown on land that was purchased less than five years ago for $25.00 an acre, and is now yielding a hay crop annually worth $100.00 per acre.

HOG CHOLERA SERUM.

The last legislature passed a law authorizing the Commissioner of Agriculture to manufacture or buy hog-cholera serum and furnish it to our farmers at cost. The amount appropriated was too small to establish a plant to make the serum. It has been supplied to the farmers at cost, which is thirty-five cents per dose of twenty centimeters, which is an average dose per hog. A bulletin has been issued giving full directions for administering the serum, and also how to diagnose the disease. This serum will be a great protection to the hog-raiser in saving him from heavy losses from cholera, which has been previously uncontrolled. A supply of this serum is kept on hand in the department ready to supply the demand for it. Virginia does not raise enough hogs to supply the home demand while no State can produce pork or bacon cheaper than this State. This protection from loss by cholera should greatly stimulate hog-raising in Virginia.

AGRICULTURAL SEED LAW.

The legislature did another good thing for the farmers' benefit in the passage of a seed law, having for its object the improvement of the quality of our agricultural seeds and the elimination of impurities and weed seeds. This law requires all seeds to be labeled, stating the quality of the seed. If the seeds are high in purity and germination, they must be labeled—standard; if not, the law requires the impurities to be put on the label so that the farmer may know the quality of the seed he is purchasing. Standards of purity and germination have been made and approved by the Board of Agriculture, governing the sale of seeds in this State, which will be found printed in this report. Under this law I have appointed a seed analyst and fitted up suitable apparatus for the examination and testing of samples of seed. It is the duty of the pure-food-inspectors to draw samples of seeds where they are offered for sale in the State, and to see that all seeds that are offered for sale are properly labeled. The law permits any farmer who is not a dealer in seeds to send to the Commissioner of Agriculture samples of the seed he has purchased, or may wish to have examined with a view of purchasing, for examination and analysis. The analysis of all samples drawn by the inspectors will be published in the fertilizer bulletins.

FERTILIZER INSPECTION.

The sale of fertilizer in this State has been closely inspected, and violations have been reported to the Commonwealth's attorneys in the counties where such violations have been found. The last legislature restored the four inspectors, one for each congressional district. The legislature in 1908 had reduced the number of inspectors from ten to six. It was found that it required ten inspectors to properly watch the shipment of fertilizers during the spring and fall seasons so as to fully protect the farmers from the shipment of adulterated fertilizers. The farmers should be very careful not to purchase any fertilizer that is not tax-tagged and branded as the law requires, and to report promptly to me any violations they may see.

LIME-INSPECTION LAW.

The General Assembly also passed a law requiring all agricultural lime offered for sale in this State to be registered with the commissioner, showing the guarantee of the seller; in burnt lime, the oxide of calcium; if unburnt, the carbonate of lime. The fertilizer inspectors are required to draw samples of agricultural lime that they find offered for sale and send to me for analysis. This law protects the farmer from buying low-grade lime and paying the price of a high-grade article. A brand-tax of $10.00 per brand is imposed by law before any agricultural lime can be offered for sale in this State. All packages of lime must bear a label stating the guarantee. If shipped in bulk, the bill of lading must give the guarantee.

THE RAPID ADVANCE IN FRUIT-GROWING.

The fine profits from fruit-growing in Virginia have encouraged our farmers to set out larger orchards, and many fruit-growers are coming into the State and investing in land for orchard purposes. Orchard lands are rapidly advancing in value. There are many well-cared-for orchards in this State that cannot be purchased for $2,000.00 an acre.

THE STATE HORTICULTURAL SOCIETY.

The State Horticultural Society has done a valuable work this year in giving practical and helpful information to the fruit-growers by holding many demonstrations, meetings in spraying and in grading and packing fruit properly for market. This society has held fruit-growers' institutes in many places where valuable lectures were delivered on the care of the orchards. The department has issued bulletins on the fruit industry in Virginia as well as discussed this subject in the farmers' institutes. The yield of apples from many orchards this year reached $5,000.00, and some crops sold for from $20,000.00 to $25,000.00, and as high as $35,000.00 from an orchard that contains 100 acres in full bearing trees. The advantages that Virginia possesses in soil, climate, and nearness to the great markets cannot be equalled in America for profitable fruit-growing. The legislature appropriated $2,500.00 last year for the advancement of horticulture; this sum was used by the State Horticultural Society advantageously.

TRUCKING IS GROWING.

Virginia is the birthplace of the trucking industry in America. The Tidewater section, particularly, is a great trucking section. The Eastern Shore and around Norfolk, where the truckers are organized, is in the lead in the trucking business in this country. In some counties in the southwestern section of the State large shipments of potatoes and cabbage have been made. From one station on the Norfolk and Western Railway 1,250 carloads were shipped during the season. Winter cabbage have been shipped from there to Cuba.

FARMERS' INSTITUTES.

A larger number of Farmers' Institutes have been held during the past year than in any previous year. The railroads and steamboat companies have shown a spirit of liberality that has been very helpful, in furnishing transportation for this work. The lectures at these institutes have been very helpful to our farmers, and the interest and attendance on the part of the farmers have increased each year. At the close of many of these meetings, a request is made to come again as early as possible. The practical discussions at these meetings and the helpful information that is sent out in the annual reports have gotten the average farmer's interest stirred, and he is doing better farming, but there is room for more improvement.

THE AGRICULTURAL MUSEUM.

The Agricultural Museum has been improved by the addition of new agricultural exhibits, especially in grasses. More than one hundred (160) varieties of grasses grown in Virginia are in the museum. Alfalfa is given special attention. The mineral exhibits that were returned from the Jamestown Exposition, with the mineral specimens that were in the Agricultural Museum in the capitol, have been installed in a hall in the basement of the library building and put under the care of the State geologist, who lives at the State University. The location of the Agricultural Museum in the capitol of the State is a very fortunate one, as more than 50,000 people visit the museum every year. This department made an instructive exhibit at the State fair where a practical lecture was delivered each day on growing alfalfa in Virginia. Several tons of alfalfa hay were on exhibition, and a large number of farmers heard the lectures daily.

THE GROWING WORK OF THE DEPARTMENT.

The work of the department has outgrown our ability to meet the demands upon us. With the approval of the board, I appointed Hon. J. J. Owen as a member of the department staff. Mr. Owen has assumed the duties of Director of Farmers' Institutes.

EXPERIMENT STATIONS.

The board has established a new Experimental Station near Staunton, in the center of the valley, where experiments will be made that will be helpful to the agricultural conditions of that section of the State. The board has entered into an arrangement with the State Experiment Station at Blacksburg to conduct the experiments at the Saxe and the Staunton Experiment Stations. The board contributes $5,000.00 per year to the support of the Virginia Truck Experiment Station at Norfolk. The board also pays annually to the State Horticultural Society $1,000.00 to aid the society in its work.

The correspondence and almost hourly personal visits to the department have continued to increase from year to year. The entire force of the department is compelled to work every day beyond the regular office hours.

RECOMMENDATION.

The magnitude of the agricultural, the horticultural, the mineral, the forestry, and the pure-food and dairy interest in this State requires more room for the work of the State Department of Agriculture and Immigration. This important work is now located in three different buildings. The State needs an office and department building where all the divisions of the Department of Agriculture and Immigration would be together, where a large museum could be made that would show all the varied and magnificent resources of this State to all who seek investment here. The number of investors in Virginia property is increasing from year to year, and an expenditure on the part of the State for a suitable building for this purpose would prove to be profitable and wise. Such a building would be a well-merited tribute to the great agricultural interests of the State and a pleasing monument to the progressive spirit of our country people.

Respectfully submitted,

G. W. KOINER,
Commissioner.

EXPLANATION OF THE VIRGINIA AGRICULTURAL SEED INSPECTION LAW.

It is a matter of congratulation that the interest of the executive and legislative departments of our State government have become so keenly awakened to our agricultural interests, and the necessity for enlightened and progressive agricultural legislation. Along these lines Virginia is fast putting herself in touch with the other States in this all-important movement.

In nothing has more substantial good to our farmers been accomplished than the law passed at the last legislature known as "The Agricultural Seed Law," having for its object the improvement of the quality of our agricultural seeds, and the elimination of impurities and weeds.

Much remains to be done, but a great deal has been accomplished. The present act, notwithstanding a few defects and omissions, represents a tremendously progressive step, and if our farmers and other parties in interest will but co-operate in carrying out and seeing to the enforcement of the law, much will have been accomplished in the development of the agricultural interest of the State.

SUMMARY OF THE ACT.

The main features of the act, briefly summarized, are as follows:

All agricultural seeds in packages of fifty pounds or over for sale or distribution are required to be plainly labelled; the sale of seeds containing a greater proportion than 1,000 to 2,000 of *noxious weeds* is prohibited; where there is present any wild onion, English charlock or wild oats, the label must so state, and must specify the percentage of each or either; if there be present weed seeds or inert matter classed in the act as impurities, in greater percentage than 2 per cent., the label shall state the name and percentum of such impurities present.

Seeds labelled "Standard" must come up to the standard of purity and germination fixed by the act, and the regulations adopted by the Commissioner and Board of Agriculture.

LABELS FOR PACKAGES OF SEED.

The form and size of the label is given in the rules and regulations, which also give full notes and directions for filling out same.

Noxious Weed Seeds.—Seeds containing noxious weed seeds in less number than 1,000 to 2,000 may be sold; but the fact that such noxious weed seeds are present must be stated in the label. The purchaser buys such seeds at his own risk.

Common Weed Seeds.—Where seeds of the common weeds are present in a quantity larger than 2 per cent. of the seeds under examination, the same and percentage of such seeds must be stated in the label.

Inert Foreign Matter.—When sand, dirt, sticks, etc., are present in a greater quantity than 2 per cent. of the seed under examination, the name and approximate percentage of such impurities shall be stated in the label.

Other Weed Seeds.—The label shall also state the name and percentage of the following weed seeds when present in any quantity whatever, viz.: wild onion, English charlock, and wild oats.

Special attention is called to the standard of purity and germination as fixed by the rules and regulations. Seeds complying in all respects to this standard (and none other) may be labelled, "Standard Seeds."

IMPURITIES DEFINED.

Particular attention is called to the list of noxious weed seeds given in Section 3 Cl. "First" of the act. These are all seeds of a specially aggravating nature. These seeds can be killed and eventually exterminated if the land is not infested anew by seeds of these weeds in sowing them mixed with grass seed and grains.

The seeds of weeds listed as impurities under Section 4 Cl. "First," are very common in agricultural seeds, and a small percentage of them may be present without serious harm, although the crop of weeds resulting will injure the grain or grass crop to a greater or less extent, depending upon the soil and climatic conditions.

ADULTERATION AND MISBRANDING.

Those sections of the law relating to the adulteration and misbranding of agricultural seeds need little comment. The practice of mixing less valuable with higher price seeds is a reprehensible one actuated by the desire to deceive and defraud, and should be condemned alike by seedmen and farmers.

EXCEPTIONS.

Exceptions to the application of the law are given in Section 8:

(1) Seeds held in store or on sale for food, either animal or human, are exempt.

(2) Agricultural seeds containing seeds of noxious weeds cannot be sold except under the restrictions cited in Section 3 Cl. "First" and "Second." Seeds containing impurities named in Section 4 Cl. "First" can be sold to a merchant for recleaning even where such impurities are present in quantities larger than ·2 per cent. But such seeds must be recleaned before exposing for sale on the general market.

(3) Seed in store for recleaning is exempt. Immediately it is offered and exposed for sale it becomes subject to the provision of the law. Also seed to be shipped out of the State is exempt.

(4) A farmer may sell seed to his neighbor, but the neighbor must take all risk of infesting his farm with foul weed seed. It is greatly to the advantage of the purchaser to buy tested seed.

(5) Mixed seeds for lawns may be sold subject only to the restrictions of Sections 3 and 4 of the act.

ENFORCEMENT.

The enforcement of the law is placed in the hands of the Commissioner of Agriculture, who, with the approval of the Board of Agriculture, may adopt all necessary rules and regulations for carrying same into effect. The various Commonwealth attorneys are charged with the duty of prosecuting violations upon the facts being certified by the commissioner.

FREE ANALYSIS.

Every citizen, not a dealer, is entitled to have samples of seeds examined and analyzed free of charge. Dealers are entitled to the same privilege on payment of a fee of fifty cents for each sample.

SIZE OF SAMPLE.

Samples of seed for testing should consist of not less than two, nor more than four ounces in weight.

Seed dealers and farmers are requested to co-operate with the Seed Inspectors' and Agricultural Department in carrying out the provisions of this law. The seedmen must necessarily charge more for his seeds where he lives up to the law, both because the better grades of seeds are higher priced, and because of the labor necessary to bring seeds up to the necessary standard. The farmer, on the other hand, can afford to pay higher prices for seed which he knows to be free from noxious weed seeds, and which has a higher germinating power. Clover seed germinating 100 per cent. may be worth twenty dollars per 100 pounds, but if it germinates only 60 per cent. it is worth to the farmer but twelve dollars per 100 pounds, and the loss does not end with the poor seed. A poor stand of hay results and only 60 per cent.of the hay crop is secured. Seeds that give a low test are low in vitality, and do not produce strong, vigorous plants. The sale of such seeds is an injury to the farmer, and hurts the trade of the seedmen.

Dealers and farmers are urged to send in samples early and not wait until time to use the seed.

All seeds purchased from dealers outside of the State are bought at the purchaser's risk. Farmers should insist that outside dealers make their seeds conform to the standard set in the Virginia law, and in no other way will our farmers be freed from the heavy tax imposed by weed growth. [This law is needed. Some samples of clover seed have tested as low as 20 per cent. germination, and timothy seed as low as 9 per cent. germination.]

SIZES OF LABEL AND WEIGHT OF PACKAGES.

Section I.

The form of label which is required by Section I of the law, and which must be attached to each package of seed over fifty (50) pounds in weight, shall conform to the following specifications:

The label shall not be less than five (5) inches long by three (3) inches wide, and shall be plainly printed or stamped in not less than eight-point heavy Gothic type. The form and style shall be substantially as follows:

(a) FOR STANDARD SEEDS.

Kind of Seed—(Barley). Name—(Oberdrucker).
Name of Seedsman, (John Doe, Seedsman,
Importer, Agent or Dealer. Richmond, Va.)
Standard Seeds.

Note.—The above label only to be used in the case of seeds of the required standard of purity and germination as provided by the State Board of Agriculture and set forth in Section II of these rules, and nothing else shall be written or printed on the standard label.

(b) FOR SEEDS OTHER THAN STANDARD.

Kind of Seed—(Barley). Name—(Oberdrucker).
Name of Seedsman, (John Doe, Seedsman,
Importers, Agent or Dealer. Richmond, Va.)

Percentage of purity or freedom of seed from foreign matter or from other seeds distinguishable by their appearance:

1. Name and number of noxious weed seeds
2. Name and per cent. of impurities or foreign matters—if exceeding two (2) per cent
3. Name and per cent. of the following seeds and bulbs:
   - (a) Wild onion.
   - (b) English charlock.
   - (c) Wild oats.

Note.—Where noxious weeds as defined in Section 3, Sub-section 1, of the Act exist in greater number than one to two thousand, the sale or distribution is prohibited.

Where any of the following seeds or bulbs are present—Wild onion, English charlock, or wild oats, the name and per cent. must be stated on the label, but none of these seeds shall be present in seeds marked "Standard."

Where seeds of the common weeds, as defined in Section 4 of the Act, are present in quantity greater than two percentum of the seed under examination, the name and percentage of such seeds must be stated on the label. The name and approximate percentage, or inert matter, such as sand, dirt, sticks, broken seeds, as defined in Section 5 of the Act, when present in quantity greater than 2 percentum as fixed by Section II of these regulations, shall be stated on the label.

This is not to apply to seeds which come up to the standard of germination and purity as fixed by the Board of Agriculture in Section II

Section II.

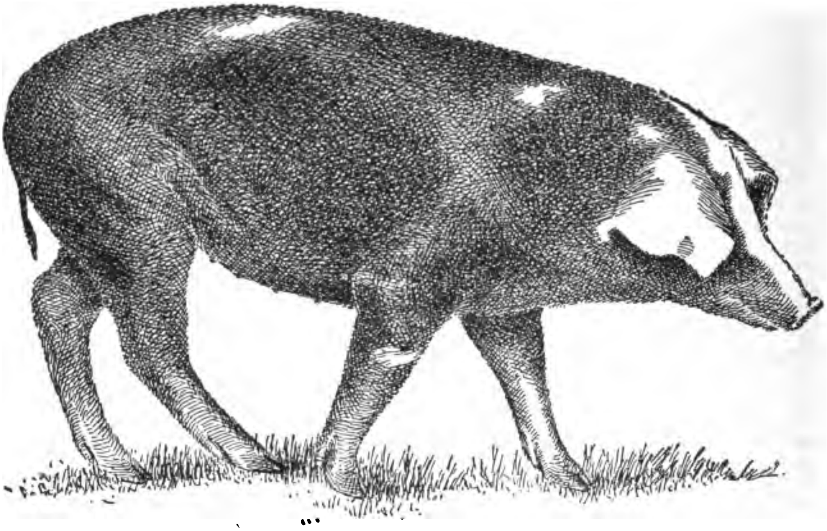
STANDARD OF PURITY AND GERMINATION.

NAME OF SEED.	Purity Per cent.	Germination Per cent.
Alfalfa	97	90
Barley	99	96
Blue Grass, Kentucky	80	50
Blue Grass, Canadian	90	50
Brome Grass, smooth	90	80
Buckwheat	96	90
Clover, alsike	95	90
Clover, mammoth	98	90
Clover, red	98	90
Clover, white	92	85
Clover, crimson	98	90
Corn, field	100	95
Corn, sweet	99	75
Corn, pop	99	80
Corn, kaffir	94	90
Fescue, meadow	94	85
Fescue, hard	94	85
Fescue, sheep's	94	85
Fescue, red	94	85
Flax	98	94
Foxtail, meadow	90	85
Millet, broom corn	98	90
Millet, common	98	90
Millet, Hungarian	98	90
Millet, German	95	90
Millet, Siberian	98	90
Oats	98	95
Oat Grass, tall	94	90
Orchard Grass	90	85
Rape	98	95
Red Top	90	85
Rescue Grass	94	80
Rye	99	95
Rye Grass, perennial	95	85
Rye Grass, Italian	95	85
Sorghum	95	90
Teosinte	99	90
Timothy	98	90
Vetch, hairy	98	90
Wheat	98	95

HOW TO GET HOG CHOLERA SERUM.

Under an Act passed by the last General Assembly the Department of Agriculture is now prepared to furnish at cost to the farmers upon their application hog cholera serum. This serum is made by the directions as recommended by the Biochemic Division of the National Bureau of Animal Industry. The cost is thirty-five cents ($.35) per dose of twenty centimeters. The serum is put up in bottles which contain twenty-five doses each; also in bottles of five doses each. All of the serum should be used at one time, as it *will not keep after the bottle has been opened. The unopened bottles should be kept in a cool place.*

The cost price must accompany each order for serum. Do not fail to give the nearest express office.



Hog Sick with Cholera.

To serve our farmers as much as possible, and owing to the inconvenience to farmers to get a suitable syringe, which is necessary to inject this serum, the department has arranged to furnish a good, strong syringe, made for this work, at wholesale cost price $2.00 (the retail price of this syringe is $3.00). The cash must accompany the order. It is entirely optional with the farmer to buy this syringe. This arrangement is made simply to accommodate those who have no syringe or are unable to get a suitable one.

SYMPTOMS OF HOG CHOLERA.

"At the beginning of an outbreak in a herd it is a difficult matter to be sure that the hog cholera is actually present, for the outward symptoms are not characteristic, but only such as might be expected in any acute disease. The same may be said of the changes which take place in the internal organs. It is therefore necessary to consider all of the features of the disease before making a positive decision concerning the presence or absence of hog cholera in a herd. The important features of hog cholera are:

USUAL APPEARANCE OF HOG WITH CHOLERA.

1. Contagiousness.

2. Symptoms of severe illness, such as fever, weakness, loss of appetite and diarrhoea.

3. Hemorrhagic spots in the internal organs or button-like ulcers in the intestines.

4. The kidneys are speckled like turkey eggs in small dark red spots from the size of a pin point to larger in size.

If these characteristics are found in a disease of hogs we may be reasonably certain of the presence of hog cholera.

DISEASES WHICH MAY BE MISTAKEN FOR HOG CHOLERA.

Among the few diseases which may lead to uncertainty are digestive troubles (due to improper feeding), swine plague, tuberculosis, anthrax and inflammation of the lungs caused by worms.

All that is necessary to prevent hog cholera is to keep the germ of the disease away from the herd. The enforcement of a complete quarantine is, however, not practicable under average farm conditions, and the best that can be hoped for is the lessening of the opportunity for infection, by placing the herd on a part of the farm that will be the least accessible to men or animals from other farms. Hog lots should never be located near public roads, if this can be avoided. All newly purchased stock should be kept separate from the main herd for thirty days at least. Hogs should be provided with clean, dry sleeping places. and the lots and the feeding troughs should be kept clean. It is well occasionally to scatter slaked lime about the lots, and to wash and disinfect the troughs. Probably the best disinfectant for this purpose is the compound solution of cresol (U. S. P.), which can be prepared at any drug store. One part of it should be mixed with thirty parts of water, and the troughs scrubbed with it. The disinfectant is then washed out of the troughs with water."

A GOOD WAY TO INJECT THE SERUM.

The needle of the syringe should be inserted nearly straight into the inside of the fleshy part of the thigh, going through the fat into the muscles of the hog.

DOSAGE.

Pigs weighing less than 30 lbs	10 to 15 C. C.
Pigs weighing 30 to 100 lbs	20 C. C.
Pigs weighing 100 to 150 lbs	25 C. C.
Pigs weighing 150 to 200 lbs	30 C. C.
Pigs weighing over 200 lbs	40 C. C.

(30 Cubic centimeters equals one fl. ounce.)

Inject directly into muscular portion of ham, preferably inside of thigh.

Serum Inoculation.—The hogs which are to be protected are injected on the inside of the hind leg with a suitable dose of the serum alone. This injection will serve to protect hogs from hog cholera for several weeks, and in some cases for a longer time. But if the hog is not exposed to hog cholera within a few weeks after this treatment the immunity which is conferred by the serum will gradually lessen in degree and the hog may again become susceptible. *If, however, the hog is exposed to hog cholera within a short time after* the injection of the serum, the immunity becomes, so far as experiments have shown, of permanent and life-long duration.

How to Use the Serum.

From what has been said, it will be seen that the injection of the serum alone is especially to be recommended in cases where there is immediate danger of exposure, especially when valuable hogs are carried to fairs and herds where the disease has already broken out, but has not progressed very far. In herds of this character all of the well animals may be treated, and even in the case of the slightly sick animals much good may be accomplished by the serum injection.

Finally, it should be remembered that this serum is to be used *especially as a preventive,* and that little success can be expected in herds which are badly affected with hog cholera. An early application is essential, and in the States which have taken up this work the farmers should notify the proper authorities immediately upon their hogs becoming ill, so that they may be treated at once.

Inasmuch as the serum described herein is a comparatively new substance, it is not to be expected that success will always follow its use, but as it has been already definitely proved that hog cholera may be prevented with this serum, the failures, if they occur, will be caused by local conditions or variations in the details of serum production, which can be corrected. Those who are interested in the subject are urged to co-operate with the State authorities who have control of this work and to assist them in their efforts to eradicate hog cholera. It is only through such intelligent co-operation that we can expect to attain the final result which is aimed at, namely, the eradication of hog cholera as a serious menace to the hog-raising industry in this country. For a fuller discussion of this subject, see United States Bulletin 379.

Some farmers who have used the hog cholera serum write as follows:

Mr. J. C. Sharer, of Petersburg, says: "The serum you sent me has proved very satisfactory. Our hogs are now entirely free from cholera."

Mr. W. J. Sebrell, Jr., Courtland, says: "I have seen this serum used this summer with fine results. If our farmers used it more as a preventive to ward off the cholera, they would never have any cholera to amount to anything."

Mr. N. G. Norfleet, Suffolk: "I found the serum to be perfectly satisfactory and have recommended it to my neighbors. Part of my herd was badly infected, and after an application I did not lose a hog."

SOIL CONSERVATION.

How to restore and maintain the productivity of the soil is the most important phase of the conservation problem. We are no longer a new nation. We have deluded ourselves with the idea that we have unbounded resources in land, in forests, in mineral wealth. We have been prodigal in the utilization of these resources. We must now pay the penalty of this prodigality. Nation-wide effort at the present time, through Federal and State agency, is directed toward the restoration of fertility in these localities. On the prairies of the West fertility is beginning to wane. In order that our heritage in the prairie country may not follow the descent of the East and the South, it is necessary that intelligent and vigorous effort be made to farm correctly. We must cease abusing the soil. The renting of land on short leases for the purpose of growing grain for market is one of the surest means of reducing the productive power of the soil. The domestic animal, with well-managed pastures and rational systems of crop rotation, is pre-eminently adapted to the development of permanent systems of profitable farming. Landowners must realize this and must take steps to improve renting methods by stocking farms with a full complement of domestic animals, where the renter is not able to do this for himself, and by giving longer leases, whereby the renter may reap the reward of intelligent management.

Land owned originally by the government has, in the main, been wisely given into the hands of millions of small owners, each of whom manages his own holdings as an independent proprietor. This method of disposing of the national domain has led to the rapid creation of well-distributed wealth. It has meant conservation by utilization on the part of a maximum number of private owners. But the very magnitude and richness of this heritage has led to such prodigality in its use that now, when the period of settlement is practically past, we find ourselves confronted with increased demands for food, which must be met by soils that have been depleted of much of their yielding power. This is an important factor in the recent increase in the cost of food.

Upland Corn.

One hundred and thirty-two bushels per acre this year. Grower, A. R. Bellwood.

The problem of food is a fundamental one in all industrial development. It was the abundance of food that made possible the marvelous progress witnessed in this country during the past century. During the last sixty years we have brought into cultivation the largest and richest body of agricultural land in the world. While this land was new and rich the production of abundant crops was accomplished at little expense and with little knowledge of the principles of conservation of soil fertility. This period of exploitive farming is now past. The cost of production is now enhanced by low yields, or the use of expensive methods of maintaining high yields. Whether the era of cheap and abundant food is past depends on our ability as a people to develop cheaper and better means of production than now prevail. We no longer have unlimited undeveloped agricultural resources. Future increase in production must come largely from better methods of farming. Whether we, as a nation, shall attain these improved methods after a long period of depression, accompanied by slow adjustment to new conditions, as has been the case in older countries, or whether we shall attack the problem resolutely and intelligently and adopt improved methods as soon as the situation demands, depends on the efficiency of those agencies that in recent years have been built up in this country with a view to meeting the problems of soil conservation and agricultural readjustment.

STEPS IN AGRICULTURAL DEVELOPMENT.

In order clearly to comprehend our present position, it is necessary to review briefly the logical steps in agricultural development. In the settlement of a new region the pioneer farmer brings with him seeds of those crops he cultivated in his former home and the live stock he deems necessary in his new situation. In a few years he has learned which of these crops are best adapted to the new environment of soil, climate and market facilities. Then follows the rapid development of a type of farming based on one or two crops for which there is a cash market. The new soil is rich, and for one or two generations is believed to be inexhaustible. It is therefore exploited of its fertility and a general change of system is instituted only when waning yields begin to bring failure to the less progressive element in the community. When this period is reached a new problem arises. Single-crop farming requires little capital. A dwelling, a few work stock and a modest shelter for them, a little fencing, and a moderate equipment of farm implements represent the necessary capital of the grain farmer in addition to his investment in land, and the last has usually been a gift from a generous nation.

EXPLOITIVE FARMING TOO LONG CONTINUED.

It is not strange, therefore, that in many communities exploitive farming continues beyond its legitimate life. In fact, such a change could hardly proceed in the older settled States while the unbounded West offered the renter and the farm laborer the opportunity to acquire a home by gift from the government, on soil fertile enough to permit, for one or two generations, profitable farming with little equipment other than energy and courage. At the same time, the nation as a whole did not suffer from the depletion of the soil in the older States, for the reason that increased production on the rich soils newly brought under cultivation in the West kept pace with the ever-increasing demand for food. Hence it was that the decrease in the agricultural population and the abandonment of a large part of the land formerly tilled in the Eastern States attracted little attention. Agricultural economists looked with complaisance on the decrease in rural population, shown in the following statistics taken from recent census reports:

DECREASE IN POPULATION AND ABANDONMENT OF LAND IN THE OLDER STATES.

Gain or Loss in Population, 1890-1900.

State.	Rural [a] (loss).	Urban (gain).
	Per cent.	*Per cent.*
Maine	8.46	40
New Hampshire	8.26	49
Vermont	12.30	59
Connecticut	12.30	60
New York	11.30	35
New Jersey	11.90	53.5
Delaware	3.13	20.4
Ohio	4.15	30.8

[a] Inhabitants not living in incorporated towns or cities.

Similarly, a decrease of 38.1 per cent. in the area of improved farm land in the six New England States between 1880 and 1900 was not regarded as a calamity, but as a natural consequence of the opening up of richer and more easily tilled lands in the West, and the development of transportation facilities between the grain fields of the West and the cities of the East. In many of the older States a similar abandonment of land has occurred that is not shown by statistics. In most of these States the area of improved land is only 25 per cent. to 40 per cent. of the total area. New land has been cleared as old land was abandoned. A conservative system of agriculture would have kept the older lands in cultivation.

THE PRESENT SITUATION.

We are now confronted by a new situation. The bringing into cultivation of new land in the West no longer meets the loss due to abandonment of older lands in the East, combined with the increased demand for farm products. Our people, instead of remaining at home and building up impoverished farms, still continue to migrate in search of virgin lands. The stream of migration which has flowed westward since settlement began on the Atlantic coast is now being deflected southward and northward. During the past six years an average of 54,000 American citizens have annually crossed over into Canada in the hope of finding new land that would bring rich returns from exploitive farming. A countercurrent of migration is even setting in from the West toward the East. A good many western farmers are selling their lands at high prices and moving to the cheaper lands on the Atlantic seaboard. Tension is felt on all sides. The exhaustion of free lands has increased the price of land all over the country. The rising price of land makes it more difficult for the young man with slender capital to acquire a home on the land; hence there is an increase in tenant farming. The situation is intensified by the prevailing unsatisfactory system of renting land. Leases are usually made for short terms. The renter has no interest in maintaining the fertility, for he has no assurance that he will receive the benefit of it. He is interested only in immediate results. He therefore proceeds to rob the soil by exploitive methods of farming similar to those which prevailed when the land was first put into cultivation.

From what has been stated above it is not surprising that the values of farm products have risen to a marked degree in the past few years. This has affected other industries. City people are beginning to turn toward the land. This department receives many hundreds of letters annually from people employed in manufacturing, mercantile and transportation industries asking for information that will enable them to become farmers.

Not only has the value of farm products increased, but exports, especially of breadstuffs, have fallen off in a marked degree. Comparing the five-year period ending in 1903 with that ending in 1908, the exports of corn and its products decreased from 135 million bushels to 82 million bushels, a decrease of 39 per cent. During the same time the exports of wheat decreased from 212 million to 114 million bushels, a decrease of 46 per cent. If America is to retain the favorable balance of trade which has characterized the past quarter of a century, it must be done not by increase in acreage, as in the past, but by increase in yields per acre. We no longer have unlimited areas of virgin soil to exploit. The question whether we shall be able to meet the increased demands for food and clothing by increasing the yields is a pertinent one. In this connection the following statistics are of interest:

CONDITIONS IN OLDER COUNTRIES.

Average yields, 1901 to 1905, inclusive, in bushels per acre.

Crop.	Germany	France.	Great Britain	Belgium	United States
Wheat	28.2	20.2	31.7	34	13.8
Rye	24.9	16.8	....	34	14.8
Barley	34.3	24.0	34.3	46.5	27.0
Oats	41.1	32.0	44.7	64.7	30.9
Corn	....	....	....	....	24.9

These figures show that in the older countries of Europe, where farming has been followed for many centuries, the problem of satisfactory yields of farm crops has been solved. The agriculture of Germany is more nearly similar to that of the United States than that of any other of the countries mentioned in the above table. It will be noted that the yield per acre of wheat in Germany is more than twice that in the United States; the yield of rye nearly twice as large; the yield of barley nearly a third larger; and the yield of oats more than one-third larger. It will be interesting to know how the German farmer maintains these yields. The following statistics give us some information on this point:

These well-formed Ears of Corn and this 93-pound Melon are the Products of Improved Soil.

Comparative area of different classes of crops in Germany and the United States.

Classes of Crops.	Germany	United States
	Per cent.	*Per cent.*
Cereals	52.0	64.0
Hay and forage	*a* 31.4	*a* 21.3
Roots	13.8	1.3
Fibers	.8	9.1
Vegetables and fruits	2.0	3.2
Miscellaneous	....	1.1

a Permanent pasture lands not included, as this item is not available for the United States.

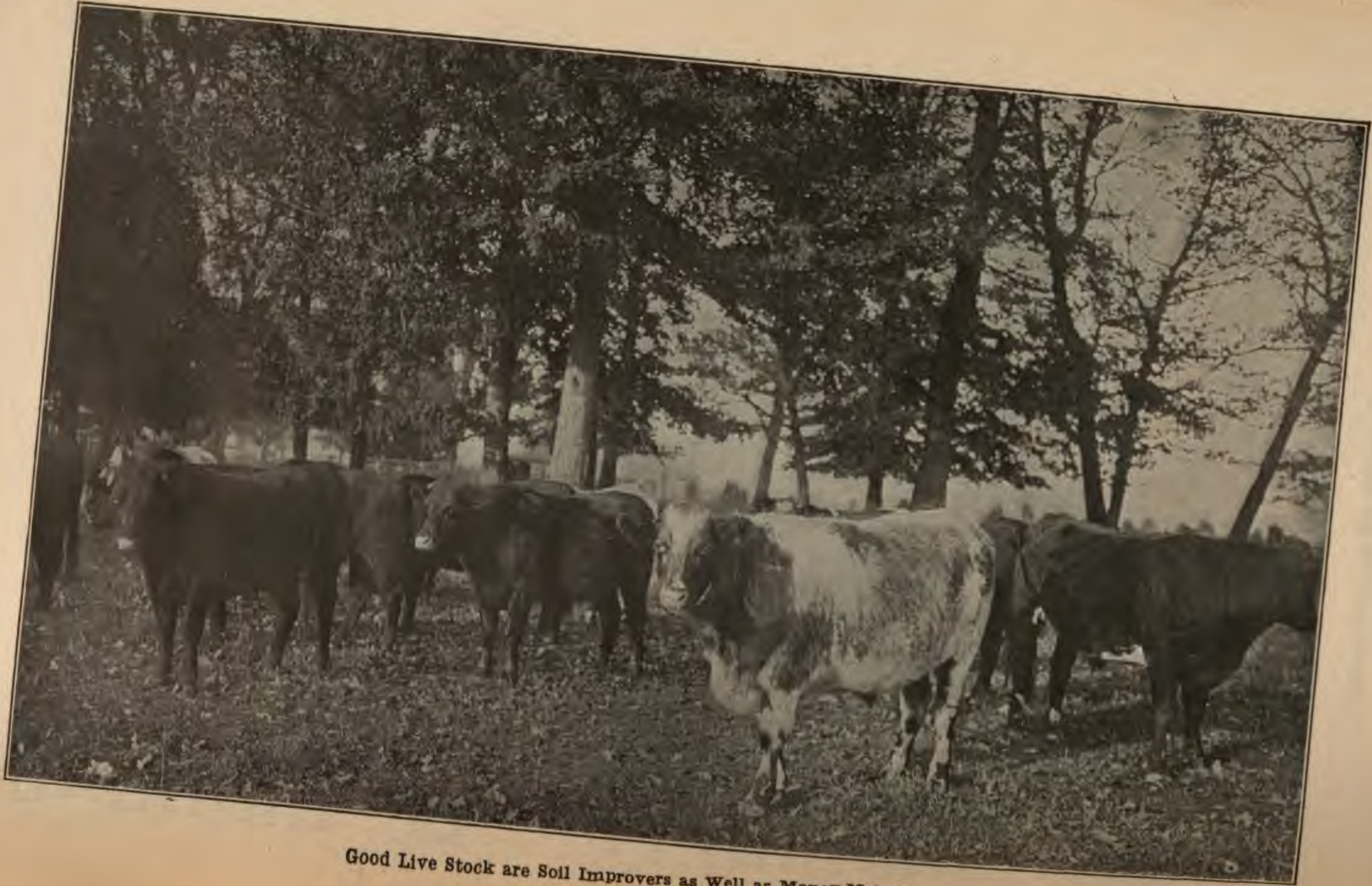
It will be noticed that the proportionate area of cereals grown in Germany is about one-fifth less than in the United States, while the proportionate area of hay and forage crops is one-half greater. In addition to that the percentage of the total area which is planted to root crops is enormously greater in Germany than in the United States. These root crops consist largely of potatoes and sugar beets, and the best German authorities estimate that at least one-third of the products of the area of these two crops is available for stock feed. They also estimate that one-third of the products of the area devoted to cereals is devoted to the feeding of domestic animals. Germany, therefore, devotes very much more of her soil to the production of feed for live stock than does the United States.

The larger proportion of land devoted to raising feed for live stock permits more stock to be kept, as shown in the following figures:

Numbers of the principal kinds of live stock maintained per 100 acres of land on farms in Germany and the United States.

Live Stock.	United States	Germany	Difference
			Per cent.
Cattle	16.3	29.1	78
Horses	4.4	6.4	45
Swine	15.1	25.8	71
Sheep and goats	15.3	19.9	30

Thus, on the same area of farm land, the German farmer maintains on the average from 30 to 78 per cent. more live stock than does the American farmer. The manure from these animals is also better cared for in all European countries than it is in this country. Not only that the United States exports vast quantities of cotton-seed meal, linseed-oil meal, and other rich nitrogenous feeding stuffs, while Germany imports vast quantities of these materials. German farmers not only conserve their own natural resources but they draw on other parts of the world to maintain the fertility of their lands. America has been mining her soil and shipping the products to Europe. In addition to the sources of fertility above given, Germany uses annually on her soil 550,000 tons of nitrate of soda, 275,000 tons of sulphate of ammonia, 1,200,000 tons of superphosphate, and 1,400,000 tons of basic slag, in addition to large amounts of potash salts.



Good Live Stock are Soil Improvers as Well as Money Makers.

Conditions similar to those in Germany are found in England, Belgium, and France. The farmers of these countries, by necessity, have worked out the problem of profitable conservative farming, and especially have they learned the value of domestic animals as a means of conserving fertility. We are now confronted by the same necessities that compelled the adoption of sound systems of agriculture in the Old World. How shall we meet this problem?

THE SOLUTION OF THE PROBLEM.

In the first place, we must increase the number of domestic animals on our farms. Where land is farmed by renters the leases must be made for longer terms, and where the renter has not the capital to provide the proper number of domestic animals these must be supplied by the landowner. We must give more attention to the condition of our pastures. In some parts of this country pastures have been overgrazed until they are nearly worthless. This is especially true in some regions where dairy farming is prominent. Stock is turned on to pastures too early, and the grass is given no chance to make the necessary growth to maintain vitality. Pastures which formerly supported one animal on two acres now support only one on ten acres. This is not universally true, but it is true in large areas. The ranges of the West have been depleted by overpasturing, and in addition are now being settled by farmers, so that the range area is decreasing. There is a serious shortage of live stock in that section, and this shortage must be met by raising more young stock on the farms of the East.

EFFECT OF LIVE STOCK ON SOIL FERTILITY.

The effect of live stock on the fertility of the soil needs no demonstration. It is well known to every intelligent farmer. Up to the present time, at least, no system of agriculture has been permanently profitable without the use of domestic animals as a means of maintaining the productiveness of the soil. Whether such systems are possible remains to be seen. It may be that the use of legumes and other crops producing humus, combined with the judicious use of commercial fertilizers, may serve to maintain high yields, but the supply of commercial fertilizers is not unlimited, and ultimately these soil amendments will have to be dispensed with.

EFFECT OF LEGUMES.

In addition to increasing the number of domestic animals on American farms our farmers must pay more attention to leguminous crops and to other crops which provide a supply of humus for the soil. Legumes, such as clover, peas, alfalfa, etc., are especially important because of the fact that with the aid of certain soil bacteria they are able to draw their supply of nitrogen from the air. Having thus an unlimited supply of this valuable plant-food constituent, they become very rich in nitrogen. The stubble and roots of a leguminous crop frequently leave in the soil sufficient nitrogen for the needs of the crop that follows. Recent investigations by this department in Kansas and Nebraska show that the average increase in the yield of corn grown after alfalfa, compared with corn grown after non-leguminous crops, is 75 per cent. A good crop of clover has a similar effect on the yield of crops which follow it. Instances are known where the practice of sowing bur clover in cotton fields in the fall of the year and turning it under in spring in time for another crop of cotton has, in three years, doubled the yield of cotton. Crimson clover sown in a similar manner between crops of corn has, in a few years, increased the yield of corn 50 per cent. or more.

The reason these leguminous crops have such a marked effect on fertility in many cases on depleted soils lies in the fact that nitrogen is not a constituent of the soil proper, but only of the decaying plant and animal matter in the soil. When soils are farmed for many years without any attention to their fertility this organic matter is rotted out and the nitrogen disappears. Hence nitrogen is nearly always the first plant-food constituent to become deficient in the soil.

The fact has already been referred to that we export a large proportion of our cotton-seed meal, oil meal, and other rich nitrogenous feeding stuffs. In 1908 we exported linseed-oil meal to the amount of 696 million pounds, cotton-seed meal 929 million pounds, and corn-oil cake 66 million pounds. These materials are all exceedingly rich in nitrogen. They should be kept at home, fed to live stock, and the manure returned to the land.

DEPENDENCE ON OUR OWN RESOURCES.

There is this difference between our situation and that of the older countries of Europe: Hitherto we have been exporters of our feed stuffs rich in fertilizer constituents, while they have been importers. They have been drawing on the newly settled regions of the world for materials with which to feed their crops. Now that we have reached the period where we need to do the same thing, there are no great areas of virgin soil from which we can draw such supplies. Indeed, it seems that the countries of Europe will not always be able to draw on supplies of this character from other parts of the world, because they will soon be needed in the regions where they are produced. The American farmer can therefore not hope, at least, in the near future, to import feeding stuffs with a view to enriching his land, but he will be making a long step forward when he quits exporting these materials and returns them to his own soil. Whatever shortages there may be must be made up by the intelligent use of commercial fertilizers. There is no danger of a nitrogen famine. We can grow leguminous crops to supply nitrogen. *We can also, by judicious use of the refuse from grain and other crops and by the use of intelligently planned crop rotations with occasional catch crops for green manure, keep up an abundant supply of humus.* Even if we had no other resources for maintaining the fertility of the soil than leguminous plants and humus-making crops we could, on much of the land in this country, maintain a much higher standard of yields than obtains at the present time.

EXAMPLES OF SUCCESSFUL FARMING.

Many examples could be given of remarkable results accomplished on American farms by the introduction of improved methods of soil management. A few instances will suffice. In New York State there are large areas of lands which formerly produced satisfactory crops, but which in recent years have been reduced in fertility to the point where their cultivation is no longer profitable by the methods in vogue in that section. Two years ago a representative of this department induced a farmer in that section to grow four acres of potatoes under his direction. This farmer had been growing potatoes for many years, using seed which had been grown for sixty years in that locality without selection to maintain its quality. His ordinary yields of potatoes were about forty bushels per acre. He was induced to secure new and improved seed and to cultivate in the most thorough manner. As a result, these four acres produced a yield of 250 bushels of potatoes per acre. Similar results have since been secured by a number of other farmers in the same locality.

An Illinois farmer a good many years ago established on his farm a rotation of corn, oats, clover. The corn and oats were fed to hogs, which were allowed to graze on the clover. Very little feed was purchased, but everything raised on the farm was converted into manure and returned to the land. At the beginning of this system of farming the yield of corn was about thirty-five bushels to the acre. Ten years later it had risen to eighty bushels per acre, the average yield for four consecutive years being 80.4 bushels per acre.

A Missouri farm, which had been devoted to corn and wheat for seventy years, and on which the yields of wheat were about eight bushels per acre and corn about twenty-five bushels, was subjected to a system of farming similar to that just described for an Illinois farm. In six years the yields of this farm were more than doubled.

In this work the following points are emphasized:

1. Deep fall preparation of the soil.
2. Planting of well-selected seed.
3. Mainly shallow and frequent cultivation of the crop during the growing season and especially after a rain.
4. The judicious use of commercial fertilizers and the increased use of home-produced fertilizers and the growing of leguminous crops.

CONCLUSION.

These facts show that the main work to be done for soil conservation in this country is that of teaching the farmer how to utilize the resources at his command. The methods to be pursued are, in the main, understood by leading agriculturists and progressive farmers all over the country, but they are not understood by the great majority of farmers. The latter must be taught. It will take time to bring about the necessary change.

The methods necessary in bringing about these changes are, first, to determine what types of farming are best adapted to the conditions prevailing in the different sections of the country, and, second, to help the farming population to readjust itself to these conditions. This readjustment is an expensive process to the farmer—new equipment must be earned and more labor must become available. Not only must the farmer be taught the principles of soil management, but he must be taught how to take better care of his animals and how to breed a better class of animals. National and State agencies are now co-operating in this work of teaching the farmer improved methods.

Present conditions in America are merely an incident in the development of a new agricultural region. Now that the period of settlement and exploitation of the soil is passed, we are under the necessity of developing systems of farming suited to the individual soils in order to develop their highest efficiency and to make the most of their fertility. Where the last has been impaired, the systems must be adjusted to obtain the restoration of the highest possible productivity under economic limitations, while keeping in view the best uses of the soil when the fertility has again reached its maximum. In this readjustment we shall have to draw on the results of scientific investigation and on the experience of older nations. Many of our own farmers have successfully met these great problems, and their experience now becomes a source of valuable information to others. Fortunately our people are intelligent and aggressive, and there is every reason to believe that they are capable of meeting the emergency which now confronts us.—*U. S. Farmers' Bulletin 406.*

Prepare a deep and thoroughly pulverized seed bed, well drained; break in the fall to the depth of eight, ten or twelve inches, according to the soil, with implements that will not bring too much of the subsoil to the surface (the foregoing depths should be reached gradually).

Use seed of the best variety, intelligently selected and carefully stored.

In cultivated crops, give the rows and the plants in the rows, a space suited to the plant, the soil and the climate.

Use intensive tillage during the growing period of the crops.

Secure a high content of humus in the soil by the use of legumes barnyard manure, farm refuse and commercial fertilizers.

Carry out a systematic crop rotation with a winter cover crop on southern farms.

Accomplish more work in a day by using more horse power and better implements.

Increase the farm stock to the extent of utilizing all the waste products and idle lands of the farm.

Produce all the food required for men and animals on the farm.

These general rules for successful farming should be observed by every farmer that he may obtain the best results from the capital and labor expended.

THE NECESSITY OF SILOS.

The real and absolute necessity of silos became apparent some years ago when grain of every kind began to soar above the reach of the farmer's purse. For eleven years we have used ensilage, and find it the most economical, as well as the best succulent ration one can have for winter feed, with the least work for the feeder. With cotton-seed meal, a pound at each feeding, and good alfalfa hay, it forms a perfectly balanced ration for milch cows, and will keep the milk flow to nearly that of the grass season. The cost of building is not exorbitant, and the buildings will last for years. Last year one of my neighbors, a young man just starting in the dairy business, found when his silo was built and filled, the fodder had cost him at the rate of $4 a ton. Remember, this included the cost of the silo. Now where can you purchase any kind of feed for milch cows at this price?

Corn Cutting, Loading and Hauling.

Delivering to the ensilage cutter, and forced into silo as shown in following cut.

"Oh," says someone, "it costs so much to fill the silos!"

Well, perhaps it does seem like a large sum when you fill the silo in the fall, but mine were filled last year for the exorbitant sum of sixty-two cents a ton, and there were 140 tons. By exchanging work with your neighbors, the money cost may be reduced even below that. The amount I put up will feed fifteen cows up to the time the grass comes, and then leave me the small silo for summer feeding when the pastures begin to dry up. Some years I have six or eight feet left in the silo, and fill on top of it in the fall. As my silos were built eleven years ago, there were none then ready to put up on the market, so had to build them. The first year I built two, one large and one small. These were square, and built of inch matched boards. A pit, eight feet deep was first dug and bricked up, and then washed over with a solution of cement, to make it waterproof. On this foundation was built the rest of the silo, and extended to the roof of the barn. Over the silo was a trap-door for filling. After building them, they were covered both inside and out with two coats of Venetian red paint, and have good silos. The next year I built another next to the first two, and they stand in the center of the barn, where formerly the hay was, that was filled with hay. These open into my cow barn with a set of doors that begin at the floor and reach to the top of the silos. These are covered around the edges with cloth pasted down with red paint, and thereby shutting out every chance for any air to get to the ensilage. One year I kept track of the cost of the ensilage, beginning with the plowing, and find by referring to the account, that it ran as follows: Plowing eight acres, $14; planting, $8; cultivating and dragging, $20; harvester, $1.50 per acre, $12; engine and cutter, $25; three teams, $16.25; three men at $2 per day, $18; three men at $1.50 per day, $11.25; three balls of twine, $1.65; feeding men and teams, $10; total for filling three silos, $136.15.

Now this shows the total to be less than a dollar a ton, and if you will tell me where it is possible to produce a sweet, succulent ration for winter feeding that can be purchased for this amount I would like to know it. I have always used the Cuban Giant corn for ensilage, the reason being, it is a very sweet corn, rich in saccharine matter, grows, with me, twelve to fourteen feet high, has a great many leaves on the stalk, and plenty of large ears. This is a southern corn, but will ripen in this section almost every season, if put in by the first of May. One year I tried the Eureka ensilage, but this is a flint corn and not so sweet, though a large yielder and prolific in long, well filled ears, but it seldom ripens here. I use the Cuban Giant for feeding, and also the Leaming.

Our method is to cover the corn ground every winter with barn compost drawn out and spread with the spreader every day. In the spring the ground is plowed about nine inches deep, then dragged until a very fine seed bed is the result. As soon as the weather will permit, about the first of May in this section, the corn is planted in rows four feet apart, and a kernel dropped every ten inches, using a planter for this work. As soon as planted, the drag is used to smooth the furrows made by the planter, and as soon as the corn is pricking through, it is dragged again, Should the weather be warm the weeder is used until the corn is high enough to see it plainly, then the sulky cultivator is put at the work, and kept going until corn is too high, when the horse cultivator takes the work as long as it is possible to go through the corn. If the season is very dry, it is cultivated oftener to bring the moisture to the surface. As soon as the corn begins to dent and glaze I prepare to put it in the silo. A harvester is put in the field a half day ahead of the drawing, so that the teams may not be hindered in their work. A cutter with blower attachment is used, as the services of two men are cut out by this method, where by the old-style of carrier it required them. Two men are put into the silo to throw the incoming corn evenly around the edges and tramp it firmly into place. On the outside two men are required at the machine to feed and cut bands. Three teams draw from the field, which is close to the barns, and two men are kept in the field to help load. Having three silos to fill, we cut Friday and Saturday, then fill up on Monday, for they will settle a good deal over Sunday. The corn is cut in half-inch lengths, for it will settle closer, and more corn can be put in the silos. The finer it is cut, the closer it packs, and the better it keeps.

The man who has charge of the engine comes the day before beginning to fill, in order that he may not keep the others waiting, for here "time is money." For the past three seasons we have used the Blizzard cutter, and it has given good satisfaction. We feed ensilage to the hens when short of green feed, and they eat it very greedily, and it makes a change for hogs in winter, though I feed but little at a time, preferably about four in the afternoon, just for a relish. Some horses like it very much and will come out in the spring with a nice glossy coat as the result. My silos will soon have to be renewed, and I expect to build one of concrete blocks on the south-side of my cow barn, opening into the barn for convenience in feeding. I do not remember just the cost of the silos, for the reason they were built at the same time the cow barn and hen house were built, and in referring to my old books find no separate account was kept.

The Corn Cutter and Wagon Combined.

Just from the field, delivering its load to the cutter. Note the blow-pipe which drives the ensilage into the silo located in the barn.

I would not do without a silo after using ensilage for so many years, if for no other reason than the convenience of handling the corn crop, as well as the fact that when I plow I will not be tempted to say something I ought not to when trying to plow under the corn stalks that

More Live Stock Means More Money and Better Soil.

were fed whole during the winter. A number of silos have been put up in this section, and I do not know of but one who abandoned the use of them. Corn, if put in at this stage, should be sweet, and smell very much like fresh brewers' grains. Ensilage will be warm to feed all winter, and for this reason is better than roots or corn fodder. A bushel of ensilage with a handful of salt and a pound of cotton-seed meal sprinkled over it, fed twice a day, to milch cows, in addition to ten pounds of alfalfa hay twice a day, corn stover at noon and plenty of fresh water, will make the cows smile, and better yet, fill the pail, when milk and butter are bringing the best price of the year.—*D. C. Dean, in Practical Farmer.*

HELP THE SOIL.

Improve your soil by plowing under something to feed the soil bacteria; they work for your soil's benefit day and night, if you feed them.

We have stated that soil fertility, in so far as the South is concerned, at least, is more a biological than a chemical problem. By this we mean that the problem of putting our soils in suitable condition for friendly "germs" to live in is more immediate importance than the supplying of chemicals. But this does not mean that we do not think chemical or commercial fertilizers needed. We have no patience with those who are crying aloud against the use of commercial fertilizers. We are not using too much commercial fertilizer. We are using much of it unwisely and should make every effort to gather our own nitrogen, but the use or commercial fertilizers probably should and will increase during the coming years.

PLANT FOOD NOT THE ONLY THING TO CONSIDER.

But while giving much needed attention to commercial fertilizers, we have overlooked and neglected what seems to me a much more important question—the living part of our soils and the part this plays in soil fertility. This neglect is due to a number of apparent causes, two of which seem most prominent. First, the chemists and teachers of agriculture have not given sufficient regard to, or appreciated the full importance of the biological side of soil fertility, and second, commercial fertilizers are easy to obtain and give marked increases in yields. Practically none of us appear to fully realize the rapidity with which vegetable and other organic matter decays and disappears from our soil. We might have learned this lesson from the fact that our upland soils, even in their virgin state, are not fertile and do not possess that large store of humus found in virgin soils elsewhere. Even in the great Yazoo Delta of Mississippi, where the dark colored lands were supposed to be abundantly supplied with nitrogen, we now find that organic matter, and the bringing about of suitable conditions for bacterial life are alone needed to double their yields.

If we could only get free from that old and erroneous idea that so-called plant food is the whole, or even the chief item of soil fertility, and appreciate the full part living organisms play in making any soil productive, we would then be in a position to make an intelligent start towards soil improvement. Friendly bacteria, those which aid in making plant foods available in the soil, must have a soil rich in decaying vegetable matter and one well drained. The free access of air is usually added as a third condition needful for the work of friendly bacteria; but a soil full of organic matter and well drained, will usually be found in that mechanical condition which will permit the free entrance of air.

BACTERIA AND CROP PRODUCTION.

Investigations by Kinsley, of Kansas, as pointed out by Hilgard, show that the amount of humus, the crop yield, and the number of bacteria in a soil maintain a more or less close relationship. Kinsley investigated the number of bacteria in five fields, described as follows:

Field No. 1 is a black loam containing considerable humus; field No. 2 is similar to field 1, but contains more humus; field No. 3 is a thin soil with clay gumbo subsoil; fields Nos. 4 and 5 are black loams, but not as rich in humus as either No. 1 or No. 2.

The numbers of bacteria in a cube of these soils measuring a little over one-third of an inch on a side (one cubic centimeter) were as follows:

No. 1	33,931,744 bacteria.
No. 2	53,596,060 bacteria.
No. 3	78,534 bacteria.
No. 4	8,643,006 bacteria.
No. 5	3,192,131 bacteria.

The crops records of these fields for ten years were in relation to the number of bacteria. Field No. 2 produced the most and field No. 3 the least.

When the humus in these soils was determined, a similar relationship was established:

No. 1 contained 2.19 per cent. of humus.
No. 2 contained 3.07 per cent. of humus.
No. 3 contained 1.85 per cent. of humus.

It was also found that the number of bacteria varied in the same field when planted to different crops. For instance, a field in timothy and clover contained in a given quantity of soil 1,380,000 bacteria. The same quantity of soil, from the same field, when in alfalfa and clover, contained 21,091,000 bacteria, and when in corn, from 1,000,000 to 2,000,000 bacteria. The rapid decay of vegetable matter in our hot and moist climate and our torrential rains remove this organic matter so quickly from the soil that system of cropping or rotations which will maintain the humus content of the soil in other climates are entirely inefficient for Southern conditions. In the past we have given less attention to maintaining the proper soil conditions for bacterial life and activity than has been found necessary in colder climates; when, as a matter of fact, we need to give much greater attention to this matter because of the heat and moisture of our climate.

HOW TO SUPPLY THE SOIL WITH HUMUS.

The plowing under and mixing with the top six to eight inches of the soil of a crop of vegetable matter will do more to improve the fertility of any properly drained soil than any other thing that can be done except the application of a large amount of stable manure. In the absence of sufficient live stock, with a large area of poor or unproductive soils, and the rapid loss of organic matter, due to climatic conditions above referred to, we must adopt special and energetic measures for increasing soil fertility, or consume long years of valuable time in our operations. Crop rotations which tend to supply a large amount of humus-forming materials and the keeping of live stock are very much to be desired, but in the depleted condition of our soils and the rapidity with which humus disappears from them, some more energetic measures are necessary. In view of these facts, the plowing under of crops grown entirely for supplying organic matter to the soil will frequently prove a good investment.

We must have this organic matter in the soil and cannot afford to wait on the slow processes which we have used in the past. Supply legume crops with phosphoric acid and use these for replenishing the depleted supply of humus, and friendly "germs" in untold numbers working incessantly will do the work of putting the plant foods in the soil in condition for the growing crops to use; but soils devoid of humus or saturated for long periods with an excess of water will never contain these faithful helpers of the farmer. In water-logged soils they drown, and in soils deficient in humus they starve. It is the first duty of the farmer to make his soil a desirable home for friendly bacteria, because this is the first step in increasing soil fertility, from which all Southern prosperity must come.—*Dr. Tait Butler.*

SOURCES OF NITROGEN.

Nitrogen, as purchased in commercial fertilizers, such as nitrate of soda, guano, tankage, and dried blood, is the most expensive manurial substance a farmer has to buy. Its cost in these various forms ranges from fifteen to twenty cents a pound. To a very large extent, at least, the purchase of the costly nitrogenous fertilizers can be avoided by the growing of green manure crops, especially legumes.

There are two principal ways in which nitrogen is naturally added to the soil. The first and much more important way is by means of legumes. This takes place only when the roots of the leguminous plant bear bacterial nodules or tubercles. The amount of nitrogen that any particular legume can add is directly proportional to the number and size of the tubercles on its roots. Little is known regarding the relative abilities of different legumes to fix atmospheric nitrogen, though they differ widely. It has sometimes been assumed that those are most efficient whose herbage is richest in this substance. This is at least questionable, as those same species may be able to utilize more of the soil nitrogen than others.

The second way in which nitrogen is added to the soil is through the activity of certain soil bacteria. These, especially if provided with decaying vegetable or animal matter, are able to use the nitrogen of the air, forming nitrogen compounds. The amount of the nitrogen thus fixed depends on a number of factors. A supply of decaying material must be available as food for the bacteria, the soil must be well aerated and must not be sour and there must be lime or other substances in the soil with which the nitrogen can be combined. With these conditions fulfilled the bacteria are most active when the soil is warm—that is, in summer. It is now believed that the principal benefit achieved by summer fallowing is the increase in the amount of nitrogen by soil bacteria. It may here be pointed out that in experiments green manure crops have yielded the best results when turned under shallow. This result is perhaps due to the fact that the best conditions are thus provided for the activity of the soil bacteria.

Two general methods of determining the amount of nitrogen added to the soil by a leguminus crop have been employed. The first is analyzing the soil before the crop is grown and again afterward. The other method is to determine the nitrogen content of plants with tubercles as compared with those that have no tubercles. The difference will show approximately the amount of nitrogen gathered from the air. The error, if any, in the latter method will be an underestimate, as there is reason to believe that some nitrogen passes from the root tubercles to the soil before the plant is mature.

At the Illinois Agricultural Experiment Station it was found that Cowpea plants with tubercles on the roots were not only much larger, but that they also were much richer, in nitrogen. Those with tubercles yielded 3.96 per cent. of nitrogen, while those without tubercles had but 2.22 per cent. of nitrogen.

At the Michigan Agricultural Experiment Station it was found that soy beans with tubercles on the roots yielded 113.55 pounds of nitrogen per acre, while those without tubercles yielded but 75.98 pounds. cowpeas yielded, respectively, 139.21 and 118.45 pounds. Thus the soy-bean tubercles increased the amount of nitrogen by 37.57 pounds per acre, or nearly 50 per cent. while the cowpea increase was but 20.76 pounds per acre, or a little more than 20 per cent.—*Farmers' Bulletin* 278.

HOW SOME OF OUR WORST FIELD CROP INSECTS PASS THE WINTER.

Chinchbugs.—In rubbish and under dead vegetation remaining on the fields.

Corn Stalk Borer.—The larva remains in the base of the corn stubble left in the field from the previous season.

Corn and Cotton Wire-worms.—Pass the winter on the roots of their food plants that remain on the field.

Corn Ear Worms.—Pass winter in the pupa or resting stage in an earthen cell about 2 1-2 inches below the surface in corn and cotton fields.

Corn Root Worms.—These are the larvae of the 12-spotted cucumber beetle and pass the winter as adults in rubbish and vegetation left in the fields.

Corn and Cotton Root Lice.—Pass the winter on various wild weeds left in the fields and which serve as food plants.

Billbugs.—Pass the winter mainly as larvae in the base of the corn stubble.

Cotton Leaf Worm.—Pass the winter in the pupal stage in sheltered places.

Grasshoppers.—Pass the winter in egg stage in soil at edge of field, in pastures and in waste places.

To follow the same crops with each other continuously increases the facilities for the depredation of insect pests attacking these crops. Not only is an intelligent rotation essential in farm practice, but the winter season should be well provided for. When we leave a corn field undisturbed after harvest, allowing the stubble to remain intact till the following spring, we should not be surprised when our crop the following year is seriously injured by corn stalk borer, corn earworm, or corn billbugs.

DODDER—HOW TO KILL IT.

Our readers who sowed clover last year, and especially our readers who have alfalfa fields of last year's sowing, or older, would do well to keep a sharp lookout for the appearance of dodder, either in their clover or their alfalfa. What is dodder? It is a yellow vine, apparently without leaves, that they will find winding itself around the clover plants. It will appear in spots, and these spots will gradually enlarge, leaving the center entirely bare of clover or alfalfa, as the case may be.

On closer examination they will find that it does not have any root at all. It grew from seed and had a root to start with, but as soon as it was able to wind around the stalk of clover or alfalfa, it let go of the ground, stuck its tendrils into the host plant, and lives on that until the poor thing dies.

If you read this description carefully, you will have no difficulty in identifying dodder. It is a vine; it is yellow, it has no leaves; it has let go of the ground, and it kills its host, or the plant off of which it lives. Those that live on clover and alfalfa do not affect any other grass or grain. Other plants have dodders which affect them. You can see every summer a large, beautiful, yellow dodder that lives on the artichokes that grow up on the roadside by the railroad right-of-way. This kind does not bother clover. There are two or three different kinds of dodder which affect clover and alfalfa or both, but it is not necessary for us to describe the difference. They are all a bad lot, to be killed on sight.

The question arises: How are we to kill this dodder? There is but one way that we know of after it has been introduced, which is usually through clover seed, and that is to mow off the clover, dodder and all, close to the ground. Be sure you do not miss any. Let it dry; then set fire to it and burn it. Be sure you do this before it goes to seed; for it seeds profusely, and if you allow it to seed you will have trouble, and plenty of it.

If you find it in spots all over the field, which you are likely to do if you have been in the market for cheap clover seed, then the only thing to do is to watch your field and mow that clover before any of the dodder forms seed. The dodder will not detract from the value of the clover hay except by lessening the quantity. Then plow up the field, put in corn and afterwards in winter wheat or oats. If you have not been careful and have allowed the dodder to go to seed, then mow your crop and burn it. Don't put that dodder seed in your hay. If you do, you will have bigger and blacker trouble than ever; for by so doing, in case you haul out your manure, which we assume every good farmer does, you will scatter it all over the farm. So look out for dodder in your clover and alfalfa fields. B. G.

THE EFFECTS OF LIME ON THE SOIL AND THE CROP.

Lime has three types of effect on soil productiveness: (1) *Physiological or Biological,* (2) *Chemical,* (3) *Physical.* In this discussion we have in mind primarily the base calcium rather than any particular compounds of calcium, except as those may be mentioned.

(1) *Physiological effects.* (a) Lime is an essential element of food for all higher plants and for many of the lower forms. It seems to be especially necessary in the leaves and stems of plants for the proper elaboration of starch. The total amount required is generally small, although it differs greatly for different plants. Franke reports the percentage of lime (CaO) in a few plants as follows:

Potato leaves	2.9 per cent.
Potato tubers	0.1 per cent.
Pea straw	1.88 per cent.
Pea seed	0.13 per cent.
Tobacco	6.18 per cent.
Wood of trees	0.01—0.02 per cent.

The amount of lime removed per acre by different crops is calculated by Warrington to be as follows:

	Yield	Lime removed per acre
Wheat	30 Bu.	9.2
Barley	40 "	9.2
Oats	45 "	11.6
Meadow hay	1½ T.	32.1
Red clover	2 "	90.0
Potatoes	6 "	3.4
Turnips	17 "	74.0

We would call particular attention to the large use of lime by the legumes, as clover and pea, because this is especially important in soil improvement.

While there is considerable need of lime as food for plants, the supply of lime in the average soil is ample for those needs. It is the exception when its use is necessary to furnish food-calcium. Lime has not, therefore, been recognized as a normal fertilizer constituent like nitrogen and phosphorus, but rather as an *amendent* or supplement to the soil mechanism.

(b) Lime maintains the solution of the soil in a condition of alkalinity favorable to many crops and micro-organisms. Most crops thrive in a neutral or slightly alkaline medium; a few plants will grow in a distinctly acid solution. The legumes, as clover, beans, peas, are especially sensitive to an acid condition, and a 20,000 solution has been found very injurious to clover roots. When the importance of the legume as a means of soil rejuvenation as well as a source of proteid animal food is remembered, this factor becomes exceedingly critical, for both legumes and live-stock are necessary to a permanent, self-contained system of soil productiveness. The distribution of certain species of plants is governed largely by the content of lime in the soil. The chestnut, for example, avoids a soil rich in lime; so does the arbutus and the rhododendron; on the other hand, the natural success of alfalfa is closely associated with an abundance of lime in the soil.

(c) The micro-organisms, particularly certain bacteria, are now recognized as an important constituent of the normal soil. Especially important are those forms concerned with the element nitrogen. The ultimate source of nitrogen is the atmosphere, but in its free form it is not available to the higher plants. In commercial fertilizers it costs fifteen to twenty-five cents per pound. Its transformation from the free atmospheric condition to forms available to crops is chiefly a function of certain species of soil bacteria which thrive in a neutral or slightly alkaline solution and are especially promoted by lime carbonate. They are of three classes: One lives free in the soil and can depend on atmospheric nitrogen; the second lives in nodules on the roots of clover, alfalfa, beans, etc., and gives these crops their special manurial value; the third group effects the formation of nitrates from the various forms of organic matter which come into the soil. In other words, however rich the soil may be in humus, which is the storehouse of soil nitrogen, the nitrogen becomes available only through the processes of ammonification and nitrification which take place best in a soil rich in soluble lime carbonate. We thus see the direct relation between lime and the nitrogen question. This is made more clear by the table of results obtained by Dr. Lyon on the Cornell University farm with limed and unlimed Dunkirk clay loam soil. The plots were planted to alfalfa. The difference between the plots was first recognized by the much darker green color of the limed section. Analyses were made of the alfalfa plants, the weed plants, and the soil extract, from each plot, with these results.

AVERAGE OF TEN PLOTS.

	Yield of Hay	Percentage of Alfalfa in mixed hay	Percentage of Nitrogen in pure alfalfa	Percentage of Nitrogen in Erigeron annus	Nitrates in dry soil. Parts per million
Limed............	103.1	70	3.30	1.70	8.08
Umlimed..........	74.4	60	2.52	1.40	4.27

It appears from this data that the yield of hay was increased almost 40 per cent.; the proportion of alfalfa was increased 10 per cent.; the percentage of nitrogen in the crops was increased; lastly, the amount of available nitrogen in the soil at the end of the growing season after feeding a larger crop was larger on the limed soil than on the unlimed soil. These results are in accord with general experience, and similar results have previously been obtained on the University farm. It is clear, therefore, that an adequate supply of lime carbonate in the soil is essential to the formation of available nitrogen.

(d) Lime assists in maintaining the favorable sanitary condition of the soil. As has been intimated, the normal soil teems with organisms. Some of these are concerned with the food supply; others with the normal decay of organic matter; still others produce an injurious or poisonous form of decay, and yet others produce various types of diseases. To a large extent those forms which produce a favorable type of decay are promoted by the presence of lime, and those which produce the opposite or toxic form of decay are to a similar extent inhibited.

This is seen in another way. An important part of the farmers' attention is now directed to the control of various diseases of his crop produced by fungi, bacteria, etc. Some of these, as, for example, the culb-root or finger-and-toe disease of cabbage, turnips, etc., can be readily prevented by the use of lime on the soil. Other diseases, as the potato scab, are favored by lime. These relations are sufficient to indicate the practical concern of the presence or absence of that material.

(2) *Chemical effects.* (a) Lime liberates certain plant food elements from their more insoluble combinations. In the early days of agricultural chemistry, it was thought that by an analysis of the soil and of the ash of plants, the proper fertilizer to be applied could be determined. We now recognize this to be impracticable for at least two reasons: (1) The soil contains a large store of the plant food constituents. Of potash, for example, soils contain from a few thousand pounds to a hundred thousand or more pounds; of phosphorus, from a couple of thousand pounds to forty or fifty thousand pounds in an acre of soil one foot deep. But the plant food is not readily soluble or available and chemical methods have not been able to distinguish with sufficient accuracy between the available and the unavailable portion. (2) Chemical determinations do not measure the favorableness of the five or six other conditions of the soil which are as essential to plant-growth as is the food supply. These include moisture, oxygen, etc. Fertilizers effect these, for their function is not single.

The two important constituents whose direct availability from the soil particles is most affected by lime are potash and phosphorus. A large array of figures and observations shows that lime liberates potash in an available form in the soil. This is to be expected from chemical laws. It is a matter of substitution. The lime takes the place of the potassium in its insoluble combinations. Probably the most representative figures on this point are those of Frear of Pennsylvania, who found on nine soils of widely different character an increase in the availability of potash ranging from 6 per cent. on muck to 55 per cent. on red shale clay. The average for the nine soils was 23 per cent., equivalent to sixty pounds potassium per acre.

Phosphorus is the mineral food element present in smallest amounts of any constituent in normal soil. It may exist in three primary combinations. These are lime phosphates, iron phosphates and aluminum phosphates. The latter two forms are exceedingly insoluble and are not materially affected by carbonated water, so that phosphate in these combinations is largely unavailable to plants. Lime phosphate, on the other hand, has its availability much increased by carbonated water over pure water. Consequently, by the use of lime which will change some of the iron and aluminum phosphates to lime phosphates, the availability of phosphorus is increased. Frear found on the same nine soils in Pennsylvania on which the availability of potash was determined, that 200 bushels of lime per acre increased the availability of phosphorus from 16 per cent. on muck to 140 per cent. on a limestone clay; in only one case—that of a black shale—was its availability decreased. The average increase on eight soils was 43 per cent., equivalent to 140 pounds per acre. From this and other investigations, it is clear that the use of lime is especially desirable on soils rich in iron and aluminum but low in lime. The net result of the use of lime is equivalent, therefore, to the application of potash and phosphate fertilizers to the soil, not to mention the marked influence on nitrates. It may be remarked further that this is entirely legitimate, as the soil store of food, while not to be wasted, is not to be hoarded; it is to be used wisely.

(b) Lime corrects the lack of basicity in many soils. This lack of basicity has often been termed acidity. That is not strictly true, as there is not a positive soluble acidity. The great majority of soils give solutions that are alkaline or neutral to phenolphthalein. But there are silicate, iron and organic compounds, largely insoluble, which have an avidity for lime, the satisfaction of which contributes largely to productiveness.

(c) It is now well established that there may be various types of toxic substances in the soil largely of an organic character. It has also been shown that some of these are rendered less injurious by an abundance of lime in the solution.

(d) Organic matter in the form of humus is a very important constituent in the soil. It represents an advanced stage in one type of decay. This type, while largely biological, is generally identified with a good supply of lime, and in the absence of lime the organic matter may disappear without the production of the humus substance. Further, the acid humic substance is very soluble and hence readily lost by leaching. The brown liquid from manure heaps and swamp land which is so characteristic of many southern streams is due to this soluble humus. A base, such as lime, forms with it less a soluble compound so that the humus is fixed and retained. The excellent supply and conditions of humus in the majority of the soils of the Northwestern States and of the Houston or black prairie soils of the Gulf States are largely traceable to their high percentage of lime. Thus we see that lime is essential to a proper utilization of raw organic matter.

(3) *Physical effects.* (a) The most marked physical effect of lime is seen on clay soil. Lime flocculates the finest particles and promotes a granular structure. This is exceedingly important, because the physical properties of the soil, particularly its porosity, which is determined by the fineness of the particles and the arrangement, determine the retention and movement of water, circulation of air, and temperature, through which the food supply is made available. Experiments show a very pronounced amelioration of puddled clay soil by the use of lime. This effect was in fact the earliest object of liming. Warrington reports the remark of an English farmer to the effect that liming clay soil enabled him to plow with two horses where he formerly used three.

(b) The effect of lime in flocculating and fixing humus has been mentioned. It is partly a physical action.

(c) Lime has been considered to bind sandy soils. We know of no experimental evidence on this point. We should consider other effects it might have as primary and this binding action under field culture as secondary.

THE GENERAL NEED OF LIME.

We have now sketched some of the effects of lime on soil, from which may be seen its importance. Before discussing the forms of lime and other practical details, a few words concerning the relative extent of soils in need of lime and also the rate of loss of lime from soil may not be amiss.

While the use of lime has been largely confined to the States north of the Mason-Dixon line and east of Indiana, that limitation is not to continue. We find that under cultivation there is a larger removal of basic elements than of acid elements. This develops a lack of basicity. The rate at which the need for lime will be developed will depend on several conditions. Among these are the supply of lime and other bases in the soil, the crop yields and types of farming, and the fertilizers and manures used. The larger the amount of humus in the soil in proportion to lime the larger will be the removal of lime in the drainage. Those fertilizers leaving sulphuric and hydrochloric acid residues in the soil especially favor loss of lime.

On the Rothamsted plots in England, about 312 pounds of lime was lost per acre from the plot receiving no manure or fertilizer, while 723 pounds were lost from the plot receiving ammonia and magnesium sulphate and acid phosphate.

In New York we have large sections of the State in the improvement of which the use of lime is highly desirable if not absolutely essential. The part of the State in need of lime is much larger than the part not in need of lime. All our highland section in the southwestern quarter of the State needs lime, especially for success with clover. Much of the lake plains and of the eastern part of the State have a similar need. *In the improvement of our soil we emphasize, first, the control of water, involving drainage particularly; second, an adequate supply of lime; third, ample humus; fourth, good tillage; fifth, fertilizers.*

Our neighboring States need much lime. Pennsylvania farmers have led in its use. The New England States, New Jersey and Maryland are all emphasizing the need of lime, and their need is not a whit greater than that of the South Atlantic and Gulf States and those in lower Mississippi valley. Study the detailed soil conditions and that fact will become apparent. The fact that soil has been derived from lime rock does not preclude that need. Many of those soils are markedly low in lime and respond well to its use. *Note that I would emphasize not lime alone but lime in connection with methods which will increase humus.*

Ohio is taking a lead in the advocacy of lime on large areas of her soil. Within the last five years, Illinois and Missouri have come prominently into the list of those States which recognize the need of lime for the upbuilding of many of their soil types. While the need is great and widespread, it is not a matter for a blanket recommendation, and I know of but one safe rule,—for each State institution and each farmer to work out the local requirements. You will readily see the field. We are now beginning to see over and through the old adage that "lime enriches the father but beggars the son," to the principle that *lime with manure and good management is good business.*

THE FORMS AND AVAILABILITY OF LIME.

The base calcium is the determining factor in the value of various forms of lime. We shall not discuss magnesia, the general chemical action of which is the same as calcium. We would not recommend the use of very high magnesian limes, especially on soils low in calcium. The best forms to use will depend on five factors:

(1) The form in which calcium is united.

(2) The actual amount of calcium contained.

(3) The availability of the compound.

(4) The fineness of the material and the convenience and expense involved in its application to the soil.

(5) The character and condition of the soil.

1. *Form of Combination.*—Calcium is used in a number of combinations. In a pure form the calcium equivalent in 100 pounds is about as follows:

	Calcium in 100 lbs.		Equivalent in composition to 100 lbs. lump lime
(a). CaO, Lump lime, freshly burned lime, quick lime	71		100
(b). $(Ca(OH)_2$—Hydrated lime, water-slaked lime	54		132
(c). $CaCO_3$—Lime carbonates, air-slaked lime, ground limestone, marl	40		180
(d). $CaSO_4 + 2H_2O$—Gypsum, land plaster	23		310
(e). $Ca_3(PO_4)_2$ Lime phosphate, ground phosphate rock	38	Pure	187
	39	25% $CaCO_3$	181
(f). $CaH_4(PO_4)_2 + CaSO_4$—Acid phosphate (15% P_2O_5)	23		310
(g). $(CaO)_4P_2O_5$ Basic slag. Thomas phosphate powder	43		165
(h). Ashes (containing quick lime)	15 to 30		450

Strictly speaking, the lime manufacturers are concerned with only the first three forms, but these must compete to some extent with other forms. Phosphate fertilizers may sometimes owe their benefits to their lime contents. The same result might then be obtained from lime at a much less cost.

In general, we would avoid the use of any form of lime containing sulphate, owing to its tendency to develop an acid condition. Sulphate fertilizers have been shown not only to increase the loss of lime but to increase the soil acidity. Ammonium sulphate fertilizers are particularly obnoxious in this way, as shown by the Pennsylvania, Rhode Island and other results. The elimination of sulphate cuts out gypsum and, as a source of lime, should exclude acid phosphate. The other forms are to be considered on the basis of their availability, cost of calcium, and supplementary material carried.

2. *The actual amount of calcium* carried is clear, from the above table. This must partly affect the cost and will determine transportation and handling charges.

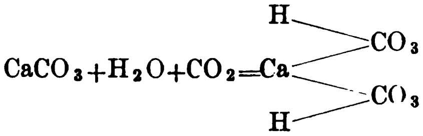
3. *Availability of lime* is closely related to the composition. (a) Chemically, the *quick lime* is most active, and on that point there is no distinction between lump lime and hydrated lime, since in a moist soil they must reach the same condition. All of the functions of lime are most effectively executed by this form. It passes into solution readily. Consequently, it is generally considered that precautions must be exercised in the amount applied. It has been considered to destroy organic matter too rapidly. Whether there is a chemical effect distinct from the biological effect is not clear. At any rate, it does seem to result in the more rapid destruction of humus than less soluble forms. It must therefore be used in less amounts, in order not to injure crop growth during the early period of its contact. Sandy soil will stand less of this form than clay. In soils low in humus, probably 1,200 pounds is a fair limit for sand and one and one-half or two tons for heavy clay. Those soils rich in organic matter will stand a larger amount without injury.

(b) *Basic slag* is a readily available form of lime and of phosphate without any inherent objectionable qualities. Its use is a matter of expense. The same point applies to ashes.

(c) In the case of all *hydrates of lime* it must be remembered that they come ultimately to the carbonate form. The soil atmosphere and moisture, especially where much humus is present, are several hundred times as rich in carbon dioxid as the outside air. While lime in large lumps "air slakes" relatively slowly, when in the fine powder in which it should be incorporated in the soil, the change is rapid. We know of no determination of the rate of this change in the soil and do not see how it can be accurately determined in normal soil; but there is much reason to believe that the reversion would be complete in a few weeks at most.

The availability of lime, whether as oxid, hydrate or carbonate, is determined ultimately by the availability of the carbonate.

(d) The solubility of *lime carbonate* in pure water is about one part to 30,000. But this does not at all measure its availability in the soil. Lime carbonate is over thirty times as soluble in carbonated water as in pure water, and the soil solution is a carbonated water. The development of caves is due to this formation of the more soluble bicarbonate where carbon dioxid is present. Thus:



$$CaCO_3+H_2O+CO_2=Ca\begin{array}{l}CO_3 - H\\ CO_3 - H\end{array}$$

Again, the availability of the lime is influenced by the organic acids and by the numerous other mineral substances always in solution in the soil water. There is abundant reason for the availability of pure lime carbonate, which may be applied as ground lime rock or marl. There is the further fact to be remembered that no injury need be expected to follow the use of ground rock or marl in any quantity. It is the form in which nature has applied lime most largely and with the results of which we are familiar. The saying that a limestone soil is always a fertile soil may be too broad and indefinite, but it has a large basis of truth. Note the blue-grass soils of southeastern Pennsylvania, the Valley of Virginia and north-central Kentucky; also, much of the wheat land of the northwest, where we have observed 50 per cent. of lime carbonate in layers of soil near the surface.

Supporting these observations are the positive results of several experiment stations over a period of years. To quote only one or two, Maryland found a somewhat larger yield from five years' results, including three crops of corn and one of wheat, when 13,000 pounds shell marl or 2,600 pounds of ground shell lime were used than when 1,400 pounds of lump lime were used.

AVERAGE OF PLOTS, FIVE YEARS.

	Grain.	Straw.
Ground limestone	8,240 lbs.	13,750 lbs.
Caustic lime	7,440 lbs.	12,100 lbs.

Hunt summarizes twenty-five years' experience with lime in a four-year rotation of corn, oats, wheat and clover at the Pennsylvania

Station. This shows that for the whole period, 4,000 pounds of lump lime once in four years gave poorer results than 4,000 pounds ground limestone every two years.

Limestone or marl will do the work, but this fact need be no discouragement to the lime dealer. We have shown that all forms of lime come to the carbonate form in the soil. We shall next show that the effect and availability of lime is determined very largely by its degree of fineness and the thoroughness with which it is mixed with the soil. *The matter therefore resolves itself into the question of the farm in which the largest amount of lime in the finest state of division can be gotten on the soil.* Practically, it is often more convenient to reach this proper degree of fineness through burning than through grinding.

4. *Fineness of Division.*—The finer the form of the lime the greater its availability. Excluding the sulphates, we are inclined to put more emphasis on the fineness than upon the combination, whether oxid, hydrate or carbonate. Considering the calcium content, the first cost and freight and the fineness, it is often better to use the lump or hydrated or ground lime than the ground limestone or marl. We usually put the matter to farmers on this basis. It is found impossible to attain the same degree of fineness by grinding that is attained by burning and slacking. Seventy-five per cent., at least, of the ground material should pass a 100 mesh screen. The larger the percentage of coarse material the larger the amount necessary to get the same net effect. Considering composition and fineness, fifty pounds of lump lime is equivalent to

60 pounds hydrated lime.
100 pounds air-slacked lime.
250 pounds ground limestone or marl.

Coarse, lumpy lime when present even in large amounts is of relatively little value in the soil. Its physical condition is bad. Just here it may be well to say that much of the so-called "agricultural lime" is of too poor quality, owing either to physical or to chemical conditions, to be used in construction. The chances are that it is equally poor for agricultural purposes, and we do not consider it to be to the interests of either the farmer to buy or the manufacturer to sell the material on a blanket statement. It may be very useful, and there may be an equitable basis for its purchase and use, but such material should stand entirely on its condition and content of calcium and other food constituent. The farmer can afford to purchase the best commercial lime if he needs lime. Any other arrangement is an adjustment to special circumstances.

5. *The character and condition of the soil* relate to the texture and composition. Clay soils are more likely to need lime than are sandy soils. Clay soils appear to be somewhat more affected physically by caustic or hydrated than by carbonated lime. On the other hand, the availability of lime carbonate is greater in a soil rich in decaying organic matter than in one deficient in that constituent. *For this and other reasons it is especially important to couple organic manures with the use of lime. They supplement each other and together bring out the best*

effects of both. Soils rich in humus can stand more lime than those deficient. Clay soils will stand more than sandy soils without injury.

The leguminous crops are more responsive than other crops to lime. Because of their relation to nitrogen-storage, they are a large factor in soil upbuilding. Consequently we see the advantage of the combination and the futility of their separate use in most cases.

The United States Bureau of Soils studied under uniform conditions in wire baskets, 220 different soils from all parts of the country. Different commercial fertilizers with and without lime, and manure and green-manure from cowpeas with and without lime, were used. As an average of all tests it was found that barnyard manure and cowpea vines with lime were tied for first rank. Lime generally increased the efficiency of complete commercial fertilizers; and lime alone ranked next to nitrate when single elements were used. This is a most interesting indication not only of the importance of lime but of the desirability of the combination of lime with organic matter.—*N. Y. Cir. No. 7, E. D. P.*

THE GROWING AND HANDLING OF BRIGHT TOBACCO FROM THE PLANT BED TO THE WAREHOUSE FLOOR.

I will begin by the burning and seeding of plant lands.

I usually select for my beds lands that are free from grass and filth of any kind—new land preferred, with a southern or eastern exposure—a fine, smooth soil preferred. I clean off the trash from as much land as I wish to burn; I usually burn with brush. This I get from cutting pine wood, or wood to cure tobacco. I pile on the brush over the amount of land I wish to burn, say some two feet deep, then set it on fire, and if the brush is dry, it will burn over sufficient to kill any vegetation, which is all that is necessary to keep down any green vegetation. When burnt, coulter up with a single coulter very shallow. Prepare the bed fine. This burning and preparing can be done any time from the first of November until first of March following. I never sow my seed earlier than January 15, in order to have good, strong, healthy plants. I seed one tablespoonful of seed to every 100 square yards. This quantity of seed is amply sufficient to insure good, stalky plants which is very material in getting a stand of tobacco which is really essential to growing a fine crop of tobacco. The way I fertilize the plants is with nitrate of soda; put this on at different times, commencing when your plants begin to come up. Put it on light at first and while it is raining; by doing so you will not be apt to kill or injure the plants, as they are very tender; about ten or twelve pounds to 100 yards is sufficient. This should be put on at three different times. Tramp or roll your bed about March 1, and put a light sprinkle of wheat straw over the bed and cover with cheese-cloth, and when the plants begin to get as large as a silver dollar, take off the straw but let your cloth remain until the plants get nearly large enough to set out, say about six days before

A Field of Fine Virginia Bright Tobacco.

planting them. If this rule is well followed you will be more than apt to have plenty of good nice plants, which is essential to growing a good crop of tobacco.

Just before my plants will do to set out I prepare my tobacco lands very fine. I then lay my rows off three and one-half feet wide drill from 500 to 1,000 pounds of some good standard fertilizer to the acre. I ridge on this with a single shovel plow, going twice to the row; then I pat or check say two and one-half or three feet; this will give sufficient distance for the plants. Always try and be ready to set out your tobacco when a wet season comes. In drawing up plants be careful not to bruise them. Always assort your plants over; by this method your tobacco will grow off more evenly and uniformly. When my tobacco has been set out, say from six to ten days, cultivation should begin. By early cultivation the crop will be much easier managed. Should delay be made in the early cultivation of the crop and same should get grassy, this will in all probability have a tendency to lesson the quantity and make a nondescript tobacco. I never like to cultivate my tobacco deep, as the roots should never be broken, especially in dry weather; deep and close plowing will often cause tobacco to be dark and bony. Cultivate tobacco shallow and often; this will have a tendency to keep the lands clean from grass and weeds, and will hold the moisture in the land. From experience I find that level and shallow cultivation is best for tobacco, especially on uplands.

A most difficult problem in growing tobacco is the topping—for instance; if you top too high the plant will not mature in time, and very likely the three top leaves will be thin and green, which is known on the market as tips; the lower or big leaves will be thin and chaffy, and you will have little good tobacco, and this will be of a nondescript character. On the other hand, if you should top too low the tobacco will be coarse and heavy and will not command a good price. In topping I take into consideration the length of time the plant has to stand and also the growth and vigor of the plant. If a large, healthy plant, I usually top high, say from ten to fourteen leaves; this amount is after priming. I prime my tobacco off at bottom, leaving the two largest leaves on the plants. If a medium plant, top from eight to ten leaves; if a small, slender plant, top from seven to nine leaves. By this method your tobacco will be more than likely to ripen uniformly.

Suckers should not be allowed to remain on the tobacco until they are large and tough; when they are pulled in this stage the leaves are frequently broken or loosened, so that they will drop off when the plant ripens, which is a great loss. Suckers should be pulled off when not over four inches long. There will only be two courses of suckers to each leaf if taken off at the proper time, unless a very heavy growth, which may bear a small bunch to some of the leaves.

After the two coats tobacco should be kept rid of worms. I have been asked the question frequently, the best way to keep off the worms. My answer is, to set out your tobacco early and let it get an early start; also, use paris green in fictitious blooms over the tobacco field. As a general rule, worms will bother early tobacco but little, as the young

Virginia Bright Tobacco Brake.

worm can't cut or eat the leaf. It seems the fly will shun the ripe tobacco and deposit her eggs on the green plants; you see that early tobacco is better on this account. My early tobacco is usually the best and brings the highest price.

Tobacco should not be cut before it matures throughly, nor should it stand long after maturity, for it will then begin to deteriorate and become thin and chaffy. Some times tobacco may look yellow and not be ripe. If you are not satisfied that it is not ripe, take off a leaf and hang it in a close room; if ripe it will soon yellow, if not ripe it will commence to dry up with a green, dusky color. If the latter occurs let your tobacco stand longer. Never cut tobacco while wet with dew or rain as it will not wilt or get supple as quickly nor as regularly as it would if the leaves were dry. Before cutting tobacco drop sticks in every fourth row sufficiently thick to hold the amount of tobacco in the rows. After the tobacco is cut and placed on sticks, lay it gently on the ground with the butts of stalks pointing to the sun, and let it remain in this position until it becomes supple, so the leaves will not break off. But it should not be allowed to remain until it gets very soft or sunburnt, as it will certainly do if the weather is very hot. Sunburnt tobacco is no better than frosted tobacco. In loading on wagon you should be careful not to let the leaves double up or they may bruise and break off.

Great care should be observed in housing tobacco. It should not be placed too thick on the tiers as it will not cure properly and is apt to houseburn. It is a mistake to let tobacco get too yellow before starting the fires, as this may make the leaf somewhat dark and dingy, nor should you begin the curing process before the leaf has reached the proper shade of yellow. The proper time to start the fires is when the leaf is a bright yellow with a few green streaks along the fibre and stems; these will all disappear as the heat goes up. The curing should be done throughly before leaving off the fires. Unless this is done the stems will get in high order and change the color of the leaf. The stems and also the stalks of the tobacco should be thoroughly cured; this will not only keep the color but will give a sweet flavor. The curing of tobacco is a most difficult problem—for instance: if you get your heat too strong in the beginning your tobacco will get in what is known as a sweat; should you keep a slow fire in the beginning of raising your heat this will also get the tobacco in a soft stupor. In the first instance if my tobacco sweats from fast or hot fires, I give it air by opening the door and making some holes around under the leaves of tobacco and let the heat cool down a little; but don't let it stay in this position long as the sweat will dry slowly up on the leaf, which will give it a dark, dingy color. On the latter heat, when the tobacco sweats from a slow fire, I push up my fire and also give it air; this will usually dry off the sweat. Always push the heat as strong as the leaf will bear; this will cure your tobacco bright throughout the barn. On the other hand, a slow fire will make a dingy, red leaf. Tobacco should be handled with great care before as well as after curing. Rough handling before curing will break and bruise the leaves, and a bruise on the leaf will not yellow, and be sure to leave a dark spot after curing; and the same will follow if the tobacco is handled roughly when in very high order after it is cured; and if handled in dry order it will break and shatter. It will always pay to handle fine tobacco with the greatest care. Fine tobacco will always bring good prices, and it is impossible to have fine tobacco if you handle it roughly.

After tobacco is cured it usually pays to assort fine tobacco carefully—as for instance: you see fine tobacco on the warehouse floor that is not properly classed. That will not bring any more than what is termed a medium grade. If this were properly classed, what fine you might get out would probably bring nearly as much as the whole pile (The best grades bring from $30.00 to $60.00 per hundred), while at the same time in the same pile, you see leaves that would not bring over $8.00 or $10.00 if in a separate pile, and the buyer usually buys the common grade. Thus, you see, this is a loss to the farmer. It is very important to have your tobacco ready for market as soon as possible, and then watch the market, and when you find the price good be sure and rush it on the market, and if you have handled your crop carefully, assorted it properly, and if it is in good order, you will be sure to receive its full value. I know of some farmers who invariably get good prices for their tobacco by following this rule; I know of others who make about as good tobacco but never realize good prices simply because they handle their tobacco carelessly and do not post themselves as to the market, and therefore do not offer their crops for sale at the proper time.

Now, in conclusion, I will say that the cultivation of bright tobacco requires the utmost care and attention, and you must begin at the plant bed and end on the warehouse floor. If you do your part well you will be certain to obtain fair prices for your crop.

J. M. BARKER,
Axton, Henry County Va.

HOG-RAISING IN THE SOUTH.

Virginia does not raise enough hogs to supply the home consumption. With the large variety of forage crops as well as corn, and the long growing season, Virginia can raise pork cheaper than the West can do it on corn alone. Hog-raising markets the crops with less labor, and improves the soil; both add to the farmers profits. A large portion of this State offers fine opportunities for this profitable business. The use of hog cholera serum now protects the farmers from heavy loss and risks.

It is sometimes claimed that hogs can not be raised and finished at a profit in the South since corn has advanced in price. The farmer is often told that he can buy his pork cheaper than he can make it. While pork has not advanced in price as rapidly as has corn, still it must be remembered that the cheapest side meat costs the consumer from fourteen to fifteen cents a pound, and that the shoulders and hams cost from eighteen to twenty-two cents a pound. It is no doubt true that the southern farmer who imitates his northern brother in his pork-making operations could buy the meat cheaper than he could make it. But if he takes his own conditions as he finds them and uses these conditions intelligently, he can produce pork cheaper than it is possible to produce it in other sections. But he cannot compete with those portions of the country where corn is comparatively cheap if he also feeds corn alone. The southern farmer must economize in the use of this feed on account of its high price. The South, in fact, feeds too much corn, as a sole feed, to hogs; there are cheap feeds which should be used along with corn.

It is generally considered that there is no other feed equal to corn for pork production. This is true, provided the corn is used judiciously. But if it be fed alone for any length of time there are few feeds which are poorer, as the experiments described below strikingly demonstrate. If, however, corn is fed in combination with other feeds, its use is to be highly commended, and it can be used to great economical advantage, too, even though it sells upon the market as high as $1.00 a bushel.

The hog is not adapted to living on corn alone, and when we require it of him we are forcing him to do a thing which is not consistent with his nature. Man likes a mixture of feeds or a change in diet; so do the lower animals. The hog in its wild state is omnivorous, feeding upon roots, nuts, fish, grass, fruit, snakes, etc.; in fact, but few feeds can be mentioned that he will not eat if he be given the opportunity. Our domesticated hogs have inherited the tendency to select their feed from a variety of substances, and when we inclose them in a pen and give but one feed we can feel assured that we are not allowing them to reach their highest possibilities.

Probably those who claim that pork can not be produced in the South at a profit mean that it can not be produced on corn alone at a profit; if so, that is entirely correct. Experimental data show that pork can not be profitably raised and finished upon corn alone when corn sells for seventy cents a bushel. The following table, which includes feeding experiments from several Southern and Western States, clearly demonstrates the fact that the man who tries to finish hogs on corn alone is following a losing business:

Hogs and Alfalfa will Make Any Farmer Rich.

TABLE 1.—*Feeding experiments showing effects of fattening hogs on corn alone.* [a]

STATION	Number of pigs	Length of experiment	Average daily gains	Pounds of feed to make 100 pounds gain	Cost of 100 pounds gain when corn is—			
					40 cents	50 cents	60 cents	70 cents
		Days	*Pounds*					
Texas	10	83	0.46	762	$5 44	$6 80	$8 15	$9 52
	10	83	.43	868	6 20	7 75	9 30	10 85
Tennessee	3	60	1.00	460	3 88	4 10	4 93	5 75
	3	60	1.00	416	2 97	3 72	4 46	5 20
	7	....	.50	410	2 93	3 60	4 39	5 12
Alabama	3	60	....	806	5 76	7 20	8 63	10 07
	3	35	....	670	4 79	5 98	7 18	8 37
	3	56	.40	621	4 43	5 54	6 65	7 76
	15	96	.69	611	4 36	5 45	6 55	7 64
Indiana	3	70	1.56	432	3 09	3 86	4 63	5 40
	4	127	.67	520	3 72	4 65	5 57	6 50
	10	30	1.40	443	3 16	3 96	4 75	5 54
	4	85	.55	557	3 98	4 98	5 97	6 96
Oklahoma	4	126	.62	470	3 36	4 19	5 03	5 87
	4	84	.50	560	4 00	5 00	6 00	7 00
	5	55	.63	801	5 72	7 15	8 58	10 01
Iowa	6	49	2.08	461	3 29	4 12	4 95	5 74
Wisconsin	35	....	1.69	459	3 28	4 09	4 87	5 74
	35	....	1.41	499	3 57	4 45	5 35	6 24
North Carolina	5	90	.18	1,284	9 17	11 46	13 75	16 04
Virginia	8	90	.24	1,263	9 02	11 28	13 55	15 79
Colorado	4	104	.70	538	3 84	4 80	5 76	6 72
Nebraska	4	119	.95	583	4 16	5 21	6 25	7 29
	29	84	1.05	452	3 23	4 04	4 84	5 65
Wyoming	3	77	.99	485	3 46	4 33	5 20	6 06
Ohio	6	66	.57	618	4 42	5 52	6 62	7 73
Average	....	....	....	580	$4 15	$5 18	$6 21	$7 25

[a] Taken from Alabama Experiment Station Bulletin 143.

The varying amounts of corn necessary to make 100 pounds gain as shown in Table 1 may be due to one of many causes, such as differences in breed, in the quality of the individuals, in the size of the pigs at the beginning, in the length of the experiment, in the climatic conditions, in the seasons of the year, etc.* The farmer, under ordinary conditions, however, will not vary much from the above averages. The table shows that when corn is worth seventy cents a bushel the cost of each pound of gain will be just about seven cents; when corn is selling at sixty cents a bushel each pound of gain put on will cost six cents; when corn is worth fifty cents a bushel each pound of gain will cost five cents; and when corn is worth only forty cents a bushel pork can be finished for only four cents a pound. It appears, therefore, that when seventy-cent corn is fed to five-cent hogs the feeder is losing twenty cents a bushel on his corn. Seven-cent pork must go along with seventy-cent corn if the owner is to strike even on feeding corn alone. As a general thing the farmers do not get seven cents for their hogs. If corn were worth but forty cents a bushel, as it often is in some of the Western States, it would be very profitable thing to raise corn and feed it to five and six cent hogs; good money could be made out of it, as the farmer would then be selling his forty-cent corn, by means of hogs, at fifty to sixty cents a bushel. But even in the corn-belt States it is more profitable to supplement the corn with other concentrates or green crops, and this practice is followed by the best farmers.

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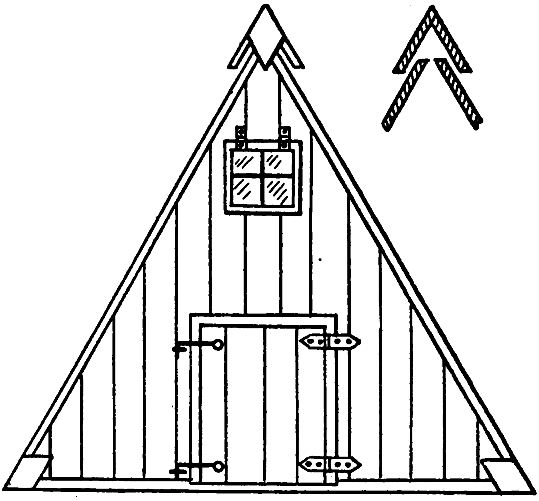
*Similar variations will be noticed in the figures for other feeds as given in succeeding tables, and these variations may be explained in the same way.

THE SOW AND THE SUCKING PIGS.

To produce good, strong, healthy pigs, they must be looked after before they are born. The mother, while pregnant, must be cared for and fed properly, if she is to give birth to a litter of pigs. As a rule the mother is neglected during the period of pregnancy, the owner seeming to think that the application of care and feed after she has farrowed is all that is required. But we should know that a poorly nourished pregnant mother means a weak, sickly litter of pigs.



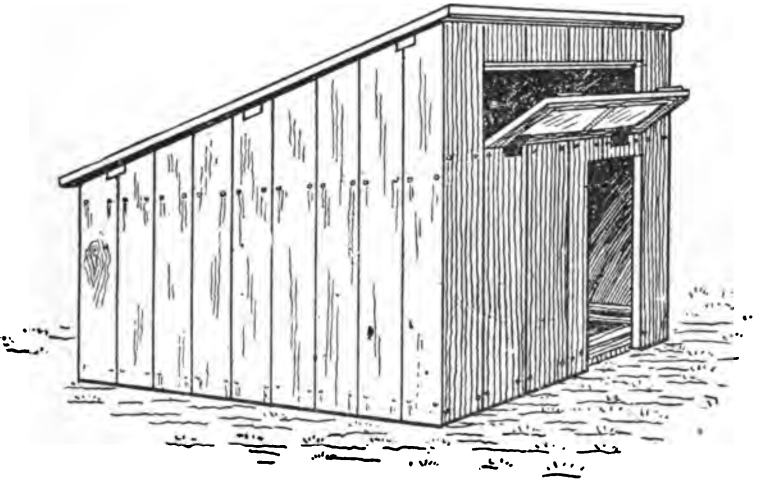
The Lovejoy Portable Hog House

Shelter.

In the South, very little shelter is needed except at farrowing time. There is no occasion for expensively constructed buildings. Of course, at farrowing time the mother should always be supplied with a building that will afford shelter from the rain and the wind for both the mother and the pigs until the pigs become dry. If the wind strikes the young pigs when they are first born they will often chill to death. Each farmer can make his own shelter, to be in keeping with his surroundings, These houses may vary in size; those with floor dimensions of six by eight feet, six by nine feet, or eight by eight feet will be found most satisfactory. The roof need not be over seven feet high at the highest point. The house may be made on runners to facilitate moving it about. To prevent the sow from crushing the pigs at farrowing time, a scantling should be fastened to the inside of the house, about eight inches from the ground, projecting about ten inches toward the center of the pen. The small pigs can run under this protection and keep the mother from lying upon them. There is no necessity for supplying a floor for these houses; some straw at farrowing time is all that is required.

Feed for Sow Before Farrowing.

It will be shown later on that pastures are the basis for the profitable handling of hogs. The pigs should be gotten up to weaning time as cheaply as possible, and the cheapest way to do this is to have a pasture for the sows to run upon every month in the year. It is very little trouble to have pastures practically the year round in the South. Of course the sow should be provided with some grain in addition to the pasture, but the pastures will save a great amount of grain. It must be remembered that the sow must be nourished in such a way that the pigs will come into the world strong and healthy. Corn alone will not keep the sow in a good healthy condition, neither will it develop the pigs in the mother's body. But corn along with a good leguminous pasture will provide her with a good ration. When pastures are not available such feeds as skim milk and bran should be used along with the corn. *Not more than one-half of her ration should ever be made up of corn;* the other half should be made up of a feed that will furnish plenty of ash and protein to build up the litter of pigs in the body. Leguminous pastures are the cheapest feeds that can be found to go along with the corn. With a good leguminous pasture the sow will be maintained in good flesh when she is fed a ration of corn equivalent to one per cent. of her live weight. For a 200-pound sow this would be two pounds of corn daily. When no pasture is provided it requires from six to seven pounds of grain to maintain a 200-pound sow in proper condition.



Bonham Portable Hog House.

Some farmers make use of a leguminous hay for the sows when the pastures become short. Alfalfa, cowpea, and soy-bean hay are all good for this purpose. They save a great amount of grain. When the farm is supplied with a cutter it will pay to cut the hay into small parts, which should be mixed with the corn and fed as a thick slop. But it will not pay to go to any extra expense to get ready to cut this hay. Some feeders throw the uncut hay on the ground, but this causes considerable waste, especially in rainy weather. In the South, where hay is high in price, it will pay to provide a small rack so that the animals can pull the hay from below without getting it under their feet.

If neither pastures nor hay are available, the feeder should use corn along with wheat shorts, bran, tankage, skim milk, etc. Corn should never be used alone. Corn and skim milk should be fed in the proportion of one part of corn to three parts of skim milk. Under average conditions the dry sow should be fed about one part of shorts or bran to three parts of corn, or one part of tankage to nine parts of corn. It would pay some farmers to use cowpeas and soy beans along with the corn in the proportion of one part of the peas to about six parts of corn.

Feed for Sow After Farrowing.

The mother should receive no feed at all for about twenty-four hours after giving birth to the pigs. She is feverish, though, and should be liberally supplied with fresh water. The second day after farrowing she should be given a small feed. It is well to start her on a light slop made up of shorts and skim milk. If there is no skim milk on hand, mix about four parts of corn with one part of shorts, cowpeas, or soy-bean meal and give a small quantity. She should be gradually brought up to a full feed; this should require about three weeks. If she is overfed at first the pigs are apt to take scours and thumps. When she is on full feed she will be eating daily an amount equivalent to about 4 per cent. of her live weight, provided she is not on pasture. If she has the run of a good leguminous pasture, at least *one-half of the grain will be saved.* If she has no pasutre, she should be fed just about as she was fed before farrowing, except that she should receive more feed than when she was dry. When the pasture is composed mainly of blue grass or Bermuda grass she should receive a grain feed equivalent to about three per cent. of her live weight, and the grain part of the ration should be partly composed of shorts, tankage, cowpeas, or soy beans. When the pasture is made up of a leguminous crop, a grain ration equivalent to not more than two per cent. of her body weight will keep her in excellent flesh, and in this case corn can be used for the grain portion of the feed.

Feed for Pigs Before Weaning.

Here, again, the most important point of all, as far as economy of gains is concerned, is to have a pasture for the pigs to run upon as soon as they begin to eat. When a good pasture is available and the mother is fed liberally of the proper feeds, the little pigs will need little in addition to what they obtain from the pasture and the mother. But the pigs will make use of some additional feed, especially if the litter is a large one. The pigs will begin to eat when they are about three weeks old if they be given the opportunity. For these young animals nothing is superior to skim milk mixed with shorts. Many farmers have no skim milk, though, so something else must be used. In such case probably the best thing to feed is a thin slop of shorts up to the time that the pigs are from four to six weeks old, after which the ration should be made up of equal parts of corn meal and shorts. These young animals should never be fed corn alone. The feed for the pigs must be fed in separate troughs, around which a fence has been built to keep the sows away.

There is no advantage to be gained by pushing the pigs too rapidly with supplementary feeds. They should not be fed much fattening feeds, as corn; they should rather be given feeds which tends to make bone and muscle, as skim milk, shorts, pasture, cowpeas, soy-bean meal, etc., so that when the time arrives to finish them for the market they will have a well developed body upon which to put the fat. They should, while young, be given just enough feed to keep them in a good healthy growing condition.

Oftentimes when the litter is small and the mother is a good milker the little pigs will need no feed at all in addition to the pasture and the mother's milk. The Wisconsin station[a] has done some experimental work which seems to show that gains on young pigs can be made as economically by feeding a given amount of feed to the mother as by feeding directly to the pigs. To be able to keep up an average-sized litter in this way, the mother must be fed liberally. The mother and the pasture should be depended upon to furnish the greater part of the feed for the small pig.

Weaning the Pigs.

Some farmers make the mistake of weaning the pigs too young. The age at which they should be weaned depends somewhat upon whether the mother is to produce two litters a year. However, the pigs should never be taken away from the mother under eight weeks of age; it is usually advisable to let them run with the sow until they are from ten to twelve weeks old. The mother's feed at weaning time should be reduced to pasture alone for a few days, so that the flow of milk will be checked; if full feed is continued when the pigs are weaned, the mother's udders and teats are apt to be ruined. The milk flow will dry up within a few days, and if the sow is thin the feed should be raised some, but she will not require as much feed as when she was suckling the litter of pigs.

The pigs should be accustomed to feeds before they are taken from the mother. If they are weaned before they are thoroughly acquainted with some concentrated feeds, they are sure to be seriously checked in their growth. The farmer who has some skim milk will experience no difficulty at all in carrying the pigs through this period, as the skim milk, with the proper grain ration, takes the place of the mother's milk. It is necessary for the pigs at this time to be supplied with a good pasture, a leguminous pasture preferred. Alfalfa affords one of the best pastures obtainable for young pigs. With a good pasture and a half ration of grain they will make good and profitable gains up to the time they are ready to finish for the market.

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[a] Wisconsin Experiment Station Reports, 1889 and 1890

CONCENTRATES TO SUPPLEMENT CORN.

It has previously been shown that the southern farmer can not afford to use corn alone as a fattening ration for swine. Fortunately for the South, it is not necessary to depend upon corn alone, as almost all the crops which can be grown in any part of the country can be grown in the South, and there are many crops suitable for hog feed which can be grown in no other section of the country. This section is wonderfully blessed in its great variety of grain and concentrates, and in addition green and pasture crops can be made to spread over twelve months of the year. *In fact, with the use of pasture crops the South is in a position to make pork cheaper than any other section of the United States.*

As stated before, the hog likes a variety of feeds and thrives better upon a ration made up of two or more feeds than upon one made up of but one. It has been proved by several of the experiment stations that wheat and corn, when fed separately to fattening hogs, are practically equal in feeding value. At the Wisconsin Experiment Station several tests were made to learn the relative value of wheat and a mixture of wheat and corn in equal parts. It was found that 500 pounds were required to make 100 pounds of gain, but when wheat and corn were fed in equal parts only 485 pounds of the mixture were required to make the same gain. When fed separately, these grains are of equal feeding value, but the mixture of the two was more valuable than either grain when fed alone. While the South has not the wheat, yet the Wisconsin experiments teach the lesson that if the most is to be realized upon the hog and the corn a supplementary feed must go along with the corn.

Dairy By-Products.

Among the various concentrated supplements which can be used with corn for fattening hogs are the dairy by-products—skim milk and whey. Of course at the present time the South has but little dairy by-products to use in finishing hogs, but as the dairy business assumes greater proportions much larger amounts of these valuable feeds will be at the disposal of the hog feeder. It is probable that the skim milk and whey could be used to better advantage in feeding the suckling mothers and the small pigs, as the green pasture crops can take their place after the pigs are weaned, but still there are cases where it should be fed to the fattening animals.

Middlings.

There are mill products in the South, and it will pay the farmers to use some of them along with the corn rather than feed the corn alone. Bran is not acceptable as a hog feed, especially for young animals. It is too bulky to feed to an animal which has a small stomach. The hog has but one stomach and that one is small when compared to the size of the animal. But, as shown below, middlings or shorts can well be used as supplementary feeds to corn.

TABLE 6.—*Experiments with middlings plus corn versus corn alone in feeding hogs.*

STATION	RATION	Pounds of feed to make 100 pounds gain	Cost of 100 pounds gain*
Indiana†	Corn alone	557	$6 96
	Corn, one-half Middlings, one-half	172 172	4 73
Wisconsin‡	Corn alone	537	6 71
	Corn, one-half Middlings, one-half	220 220	6 05
Tennessee‖	Corn alone	1,260	15 75
	Corn, two-thirds Middlings, one-third	407 203	8 13
	Corn, one-half Middlings, one-half	195 195	5 36
	Corn, one-third Middlings, two-thirds	136 274	5 81

* Price of feeds: Middlings, $30.00 a ton; corn, 70 cents a bushel.
† Bulletin 108.
‡ Report, 1885.
‖ Bulletin, vol. 15, No. 5.

If the average of the three above experiments be taken it is found that each 100 pounds of pork made cost $9.80 when corn was used exclusively, and when middlings were used along with the corn 100 pounds was made for $6.01, which was a saving of $3.79 a 100 pounds made as a result of introducing some middlings into the ration. With hogs selling at five cents a pound, and middlings at $30.00 a ton, when corn alone was used only 35.7 cents were realized upon each bushel fed, but when the corn was fed in conjunction with middlings 41.2 cents were realized for each bushel. In many places in the South hogs have been selling for six cents a pound, in which case, when corn was fed alone 42.8 cents would be secured for each bushel, but when fed with the middlings the corn would realize, through the hogs, 77.3 cents a bushel. As a result of using middlings the farmer can secure more for his corn than if he had not done so. Still, profits can not be made as a rule upon hogs when they are fed nothing but corn and middlings; that is, when corn is quoted at seventy cents a bushel and middlings at $30.00 a ton and hogs sell at five cents a pound live weight. Some other feed or feeds must be secured to go along with corn.

It will be shown later on that pasture crops can be employed so that the feeder can use high-priced concentrates and still realize excellent returns upon them. The problem of high-priced concentrated feeds is ever present in the South, yet the high prices of these feeds need not force the southern farmer to discontinue pork raising. They need only force the adoption of new methods and systems whereby he may be enabled to make pork cheaper than he has ever made it before.

Tankage and Meat Meal.

There are at least two packing-house by-products—tankage and meat meal—which should be more generally introduced in the South as feeds to go along with corn. Either one of them would cheapen the ration materially and make corn worth more a bushel as a hog feed. In every case where either one was used in the experiments shown in the following table the cost of gains was reduced below the cost when corn alone was used:

TABLE 7.—*Experiments with packing-house by-products in feeding hogs.*

STATION	RATION	Pounds of feed to make 100 pounds gain	Cost of 100 pounds gain*
Alabama*	Corn alone	575	$7 19
	Corn, nine-tenths Tankage, one-tenth	352 392	5 18
Nebraska‡	Corn alone	583	7 28
	Corn, nine-tenths Tankage, one-tenth	446 51	6 59
	Corn alone	343	4 29
	Corn, nine-tenths Tankage, one-tenth	290 32	4 27
Oklahoma‖	Corn alone	681	8 51
	Corn, seven-eighths Meat meal, one-eighth	328 468	5 04
	Corn, eleven-twelfths Meat meal, one-twelfth	401 36	5 74
Tennessee¶	Corn alone	1,500	18 75
	Corn, 95 parts Meat meal, 5 parts	485 25	6 56
	Corn, 90 parts Meat, meal 10 parts	450 50	6 63
	Corn, 85 parts Meat meal, 15 parts	408 72	6 52

* Price of feeds: Corn, 70 cents a bushel; tankage, $40.00 a ton; meat meal, $40.00 a ton.
† Bulletin 143. ‡ Bulletin 107. ‖ Bulletin 80. ¶ Bulletin, vol. 15, No. 5.

At the Alabama station when corn alone was used only 48.7 cents were realized for each bushel fed, but when a one-tenth part of the corn ration was made up of tankage the sum was increased to sixty-seven cents, assuming that the hogs sold for five cents a pound live weight. The average of the work in Nebraska shows that when corn alone was used 60.5 cents were secured for each bushel; when tankage was fed along with corn the returns were 63.5 cents a bushel. In Oklahoma, when corn was fed alone but 41.1 cents were secured for a bushel, but when meat meal supplemented the corn the amount averaged sixty-four cents a bushel. In Tennessee only 18.7 cents were realized upon each bushel of corn when it was used alone, but when the meat meal was used along with it, its value was raised to 50.3 cents (average of three lots).

Cotton-Seed Meal.

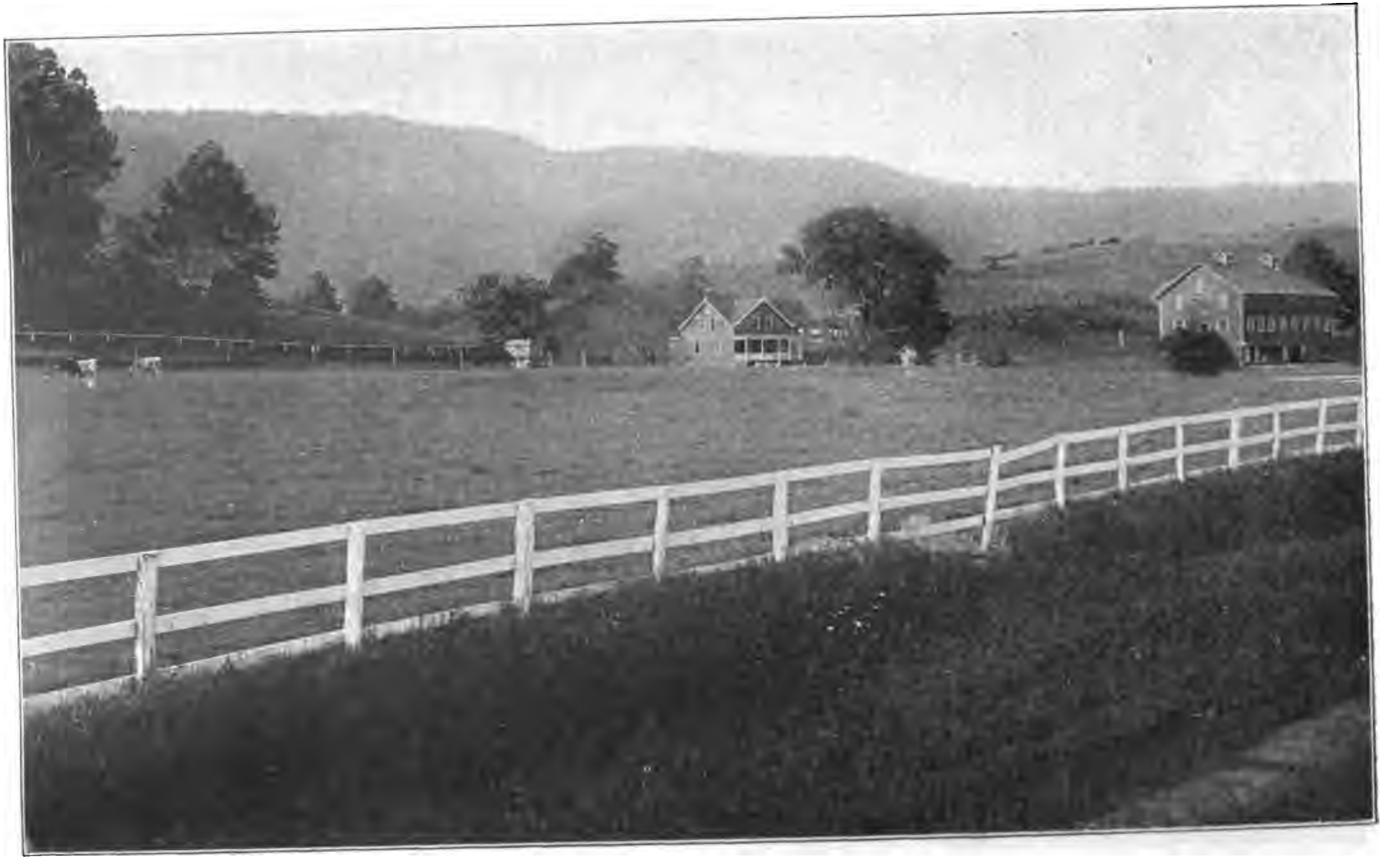
The deaths that sometimes occur as a result of feeding cotton-seed meal to hogs deter the majority of farmers from using it. It is a feed that, if used at all, must be used in moderation and with judgment. The Bureau of Animal Industry and most of the southern experiment stations have fed it both fermented and sweet—and killed pigs in both cases. There is a risk when it is used for long periods of time, and the man who feeds is should bear in mind this risk. It is not a feed for the farmer to experiment with. He should keep well within bounds when feeding cotton-seed meal to his animals. It is not safe to feed it to hogs, even when making up only one-third of the whole ration, for more than twenty-one days. If it is to be used longer than twenty-one days, the proportion of the meal should be cut down to one-fifth or one-sixth of the entire ration, and even then there is great danger. This danger may be averted somewhat by allowing the hogs plenty of succulent pasture.

Aside from the deaths that may occur, cotton-seed meal is an excellent feed. In fact, it is probably the best feed in the South to go along with corn. It has been charged that it is impossible to keep the hogs eating well when part of the ration consists of cotton-seed meal, but the writer has experienced no trouble in keeping all the animals keen for the next meal when the mixture of corn and meal has been fed as a thin slop, so that it could be drunk rather than picked up and eaten. If it is fed in a doughy condition, the pigs will soon go "off feed."

PASTURE CROPS TO SUPPLEMENT CORN.

The facts so far presented show one thing clearly—when corn is used alone as a hog feed money is almost sure to be lost. It has also been shown that the feeding value of corn is increased as a result of the use of almost any supplement. But even when corn is assisted by the supplementary feeds mentioned, there are but few cases where seventy cents is realized for a bushel of corn; that is, when hogs sell for five cents a pound live weight. Under present conditions the southern farmer must see his way clear to realize seventy cents a bushel upon his corn when fed to hogs before he can look upon the hog business as a profitable one. In short, concentrated feeds of all kinds are upon such a high level of prices that the farmer can not afford to limit the feed of the hog to them alone. Help must be sought outside the concentrated feeds.

The supplementary feeds heretofore mentioned are almost all good and should be used in hog-feeding operations, but the future of profitable hog production in the South depends upon the use of green or pasture crops. It is possible for the southern farmer to have grazing crops practically the year through, and many of the best farmers have them The southern farmer has, in fact, a decided advantage over the northern farmer in this respect. We have seen that a variety of feeds almost always produce more satisfactory results than one feed. Pastures and green crops can be used to furnish variety better than any other feeds. The southern farmer has grown so accustomed to placing his hogs in a small pen when the fattening period arrives that he has almost forgotten that the hog can make valuable use of many green crops if he be given the opportunity.



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Permanent Pastures.

Until the farmer sees his way clear to make a permanent pasture, or has one already made, he should keep out of the live-stock business. It is, in fact, almost impossible to realize a profit upon any kind of stock without good pastures. Therefore, for the first thing to be done when one contemplates engaging in stock raising is to establish a pasture.

The South, which is the very section where they can be made easily, is sadly deficient in pastures. No attention has been given to them; But the southern farmer, if he will devote some time and effort to the subject, can have as good a pasture as was ever seen in Kentucky or Missouri and have that pasture available for grazing more months in the year than is possible in those States. For a permanent pasture there is no combination, either in the North or in the South, that will equal bur clover and Bermuda grass. The Bermuda can be grazed throughout the summer months and the bur clover from January until the Bermuda comes on again. The combination will afford grazing at least ten months of the year. Both plants are permanent after they are once established. To supplement the permanent pasture, temporary pastures should be grown, as cowpeas, peanuts, etc., but no farmer who has stock can afford to be without this permanent pasture combination to be ready for use when the temporary pastures can not be employed.

Rape Pasture.

One of the valuable green crops for hogs is rape. It can be sown in the fall after the summer crops are taken off the land, and within seventy days is ready for the hogs to be turned upon it. It is a winter-growing crop, or one that can be used between the two summer crops. As a result of its use the land can be kept in use and covered with green vegetation the year round. Several experiment stations have demonstrated its value as a hog feed.

TABLE 9.—*Experiment showing value of rape as a pasture to supplement corn in feeding hogs.*

STATION	RATION	Feed to make 100 pounds gain	Cost of grain for 100 pounds gain	Value of 1 acre of rape in terms of corn*
				Bushels
Alabama†	Corn Rape pasture (first grazing)	294 pounds 0.18 acre	$3 67	26.8
	Corn Rape pasture (second grazing)	205 pounds 0.205 acre	2 56	31.3
Wisconsin‡	Corn alone	403 pounds	5 03	....
	Corn Rape pasture	282 pounds 0.048 acre	3 52	45.0

* Assuming that 564 pounds of corn are required to make 100 pounds gain.
† Bulletin 143. ‡ Report, 1900.

While rape when planted in the spring will make a summer growth almost anywhere in the South, it is not advisable for the farmer to use it as a summer pasture. Other pastures can be used during the summer months, and the rape can be sown in the fall, after the summer crops are taken off the land, and be ready for pasturing by January. As a rule, lands lie idle throughout the winter months, thus exposing them to the heavy washes, but if rape is used the land can be made to produce a green crop the year round, and at the same time afford the fattening or breeding hogs a good winter pasture.

The experimental work in both Alabama and Wisconsin has shown rape to be an excellent grazing crop to supplement corn. In Alabama the area was grazed twice, as the rape grew up behind the hogs after they had grazed it the first time, and as a result of both grazings it was learned that one acre of the rape pasture was equivalent to 61.9 bushels of corn (assuming that 580 pounds of corn will make 100 pounds gain); or, leaving out of consideration the expense of making the crop, each bushel fed at the first grazing was worth 95.8 cents (hogs at five cents) and each bushel during the second grazing realized $1.36. If it cost $8.00 to make an acre of rape, and this expense is charged against the gain, the corn during the first grazing sold for 67.8 cents a bushel while that of the second grazing sold for 91.6 cents. In the Wisconsin test one acre of rape was found to be equal in feeding value to forty-five bushels of corn, or, estimating, as in the Alabama test, the corn sold for 99.6 cents a bushel when the cost of making the rape crop was not considered, and for 91.9 cents a bushel when the cost is counted against the gain at the rate of $8.00 an acre. These results were secured in winter, a time of year when the average farmer is realizing no returns at all upon his land. Thus the farmer is one crop ahead, equal to about thirty bushels of corn.

Rape is not a legume; it will not enrich the soil. Its chief value lies in the fact that it can be grown in the winter time between the main farm crops. It comes off in the spring in ample time for the same area to be planted in any of the general farm crops.

Plants for Winter Pasture.

Many plants, in addition to the ones previously mentioned, can be used for winter pasture. Of course it is more difficult to secure winter than summer grazing, but with the proper use of bur clover, rye, oats, vetch, and crimson clover—all fall sown—there is little trouble to secure grazing areas throughout the whole winter. Bur clover is a permanent pasture and will grow upon almost any character of soil. It occupies the land with Bermuda, but makes its growth in the winter time and dies down when spring appears, and the Bermuda takes its place. Rye, oats, vetch, and crimson clover can be fall sown, following the general summer crops, and be ready for use during the winter and early spring months. The following details regarding winter crops may be of assistance:

TABLE 11.—*Crops for winter grazing.* [a]

CROP	TIME TO PLANT	Amount of seed to the acre	Number of days from planting to grazing time
Oats	Sept. 1-Nov. 1	1½-3 bushels	90-128
Rape	Sept. 20-Oct. 15	4-6 pounds, drilled	60- 75
Rye	Sept. 1-Nov. 1	1½-2 bushels	90-120
Vetch (with or without oats or rye)	Sept. 1-Oct. 15	1 bushel	90-120
Bur Clover	Aug. 1-Oct. 1	15-20 pounds, cleaned 36 pounds in bur	90-120
Crimson Clover	Sept. 1-Oct. 1	15-20 pounds, broadcast	90-120
Chufas	Mar. 15-June 1	3-4 pecks	120-240

[a] Alabama Bulletin 143.

Plants for Summer Pasture.

The pigs which are born in late winter and early spring should be finished for the market, or for home killing, the following fall or early winter. It will seldom pay to keep them through the first winter. When the pig is sucking the mother both should be given the run of a pasture crop in order that grain may be saved. If the pig is born in late winter, any of the crops heretofore mentioned can be used until the summer crops begin to come on. When green crops and pastures are thus used the pig can be gotten up to weaning time as cheaply, perhaps more cheaply, than he can be carried from weaning time to a finish. Bur clover, which is a part of the permanent pasture system, should, of course, be used during the late winter and early spring months. When the pigs are from sixty to seventy-five pounds in weight they are ready to begin to finish, and this is the time that the summer pasture crops should be ready to use. This date will be about August.

Cowpeas as a Grazing Crop.

Through the use of quick-maturing varieties of cowpeas this plant can be made to be one of the very early summer-grazing pastures. If two or more varieties be used, or if the same variety be planted at different dates, the grazing period can be extended over several months. It is, perhaps, best to use other plants, which will be mentioned later. to extend the grazing period. Several of the southern stations have used the cowpea pasture for hogs. The value of this pasturage is shown by the following results at the Alabama station:

TABLE 12.—*Cowpea pasture for fattening hogs.* [a]

STATION	RATION	Feed to make 100 pounds gain	100 pounds gain	Value of 1 acre in terms of corn
				Bushels
Alabama	Corn alone	586 pounds	$7 33	
	Corn, one-half ration	307 pounds	3 84	
	Cowpea pasture	0.137 acre		36.4

[a] Bulletin 93

The "Unknown" variety of cowpeas was used in the foregoing work. The stand of cowpeas was thin and the rows were about four feet apart. When the pigs were placed in the field the leaves were all green and only one-half of the pea had taken on the color of maturity. The other pods were all green, but most of them had attained full size. Even with the thin stand and the rows far apart good results were secured. When the corn was fed alone only 47.8 cents were realized for each bushel, but when cowpea pasture was used in addition to the corn each bushel was worth 71.3 cents (charging the crop at $8.00 an acre, fertilizer not considered). When the cost of the crop was not taken into account each bushel of corn proved to be worth 91.3 cents.

At the Mississippi station[a] cowpea pasture was grazed without grain. In 1903, although the crop was grown on thin land, one acre of cowpeas produced 350 pounds of pork. In 1904 the crop was grown on good valley land and produced 483 pounds of pork to the acre. The hogs were turned on the crop when the peas were ripe. Better results would no doubt have been secured if the animals had been given the run of the field about two weeks before the maturity of the peas.

In 1906 the Mississippi substation[b] turned eight sows with their thirty pigs into a red-clover pasture of three and one-half acres on March 20, the red clover having been sown the previous fall. This furnished ample grazing until August 20, when they were turned into a four and one-half-acre lot of corn and peas. The thirty pigs were killed out of this pasture November 1 without the addition of any other feed and dressed 117 pounds each, at an average of 196 days. The pigs ate approximately six bushels of corn each. When land rent is estimated at $5.00 an acre, corn at seventy cents a bushel, and the cost of seeding the red clover is also taken into account, each pig cost $4.98.

It is getting to be a common practice in the Middle States, where cowpeas thrive well, to plant the peas in the corn at the last cultivation and graze the hogs on both crops. This method saves a great amount of labor, and the waste of corn is very small indeed if small pigs are given the run of the field after the fattening animals are taken off; in fact, the loss of corn is not as great as is usually the case when hired help gathers it.

Soy-Bean Pasture.

The soy bean is a very valuable crop both for hay and for use as a pasture for hogs. The Tennessee station, Bulletin eighty-two, has compared the cowpea and the soy bean as to their habits of growth, yields, etc. According to this bulletin the cowpea has the following advantages over the soy bean: (1) The soy bean may fail to come up through a crust which would offer little resistance to cowpeas. (2) The germination of the cowpea seed is surer than that of the soy-bean seed, which is liable to be spoiled by heating. The cowpea is therefore better than the soy bean for broadcasting, especially on land that is heavy and liable to "bake." (3) The cowpea is much better suited than the soy bean for planting with either corn or sorghum. (4) Cowpea hay is more easily cured by the methods in common use, without the increased loss of either leaves or fruit, than soy-bean hay.

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[a] Report for 1905.

[b] Bulletin 106.

The soy bean, on the other hand, appears more valuable than the cowpea: (1) as a grain producer, (2) as an intensive crop, (3) as an early hay or grazing crop (for which purposes the early and medium varieties will produce either hay or seed several weeks ahead of any variety of cowpeas which has been tested at the station), (4) the seed decay more slowly than those of the cowpea when left on the ground, so are better adapted to being pastured off by hogs.

Rabbits feast upon the soy bean while they will not bother the cowpea at all. Therefore the farmer who plants soy beans should plant enough for both himself and the rabbits. The following tests show the value of feeding with corn alone as compared with a combined ration of corn and soy-bean pasture:

TABLE 13.—*Experiments showing value of soy-bean pasture for fattening hogs.*

Station and Year	Ration	Feed to make 100 pounds gain	Grain cost of 100 pounds gain	Value of 1 acre in terms of corn
				Bushels
Alabama (1907)*	Corn alone	456 pounds	$5.70	
	Corn, one-half ration	157 pounds	1 96	
	Soy bean pasture	0.28 acre		19.3
	Corn, one-half ration	437 pounds	5 46	
	Sorghum pasture	0.57 acre		0.6
Alabama (1908)†	Corn alone	572 pounds	7 15	
	Corn, three-fourths ration	130 pounds	1 62	
	Soy bean pasture	0.164 acre		48.2
	Corn, one-half ration	111 pounds	1 39	
	Soy bean pasture	0.206 acre		39.9
	Corn, one-fourth ration	54 pounds	.67	
	Soy bean pasture	0.219 acre		42.3

* Bulletin 143. † Not published.

In the first test reported above neither the sorghum nor the soy bean crops were good. They were both cut short on account of extreme drought at the time of maturing. In the first test the soy bean field was compared with a sorghum field. The hogs were turned upon the fields at the same time, the beans lacking about two or three weeks of being ready to "pop out," while the juice of the sorghum had sweetened. The soy beans proved to be greatly superior to the sorghum. In fact, the sorghum was practically worthless, while satisfactory results were secured from the soy beans. When corn alone was used, 61.4 cents were realized upon each bushel, with hogs at five cents; but when the corn was supplemented by the soy bean pasture each bushel of corn used was worth 98.6 cents (allowing $8.00 to make each acre of soy beans).

The soy bean crop of 1908 was a good one, and of course better results were secured than in 1907. It cost $8.50 an acre for the station to put in, fertilize, and cultivate the soy-bean crop. Rent on lands in eastern Alabama is about $2.00 an acre. When the cost of making the crop, rent at $2.00 an acre, and corn at seventy cents a bushel are all charged against the pigs, 100 pounds of gain were made as follows:

TABLE 14.—*Cost of fattening hogs on soy bean pasture, including all charges.* (*Alabama experiments of 1908.*)

RATION	Cost of 100 pounds gain
Corn, three-fourth ration Soy bean pasture	$3 31
Corn, one-half ration Soy bean pasture	3 48
Corn, one-fourth ration Soy bean pasture	2 96

Even when the interest on the land and the cost of putting in the crop were counted against the gains, pork was still made for less than one-half of what it cost when corn was used alone. Again, when corn alone was used only 48.9 cents were secured for each bushel, but when a three-fourths, a one-half and a one-fourth ration of corn were used along with the pasture the value of a bushel of corn was raised to $1.59, $1.69 and $3.35, respectively (estimating the cost of making the crop at $8.00 an acre).

The Southern yellow variety of bean was used in all cases. Other varieties can be used if it is desired that the grazing period should be extended. For instance, the Hollybrook variety is ready for grazing two to three weeks before the Southern Yellow, although planted at the same time.

Peanuts.

Other things being equal, the legumes should always be made use of when planning a succession of crops for hogs on account of their favorable influence in building up soils. Peanuts rank among the exceedingly valuable leguminous hog crops. Many farmers are already aware of their high feeding value, and they are used in those few sections of the South that at the present time are producing more pork than is used at home. As a rule, when a hog-producing section is found in the South, a peanut-growing section is also found. This plant, used along with soy-beans, affords a long summer and fall grazing season. It is a very valuable crop for fattening hogs, as will be seen from the table following.

TABLE 15.—*Experiments showing the value of peanut pasture for fattening hogs.*

Station	Ration	Feed to make 100 pounds gain	Cost of grain for 100 pounds gain	Value of 1 acre of peanuts in terms of corn
				Bushels.
Arkansas*.........	Corn alone..............................	379 pounds...	$4 73	....
	Peanut pasture alone....................	0.079 acre....	....	85.6
	Corn, ½ ration.......................... Peanut pasture.........................	147 pounds... 0.146 acre....	1 84	.... †52.9
	Corn, ½ ration.......................... Peanut pasture.........................	154 pounds... 0.139 acre....	1 92	.... †52.7
Alabama‡.........	Corn alone..............................	611 pounds...	7 73	....
	Corn, ½ ration.......................... Peanut pasture.........................	148 pounds... 0.45 acre.....	1 85	.... 18.4
Alabama**........	Corn alone..............................	560 pounds...	7 00	....
	Corn, ½ ration.......................... Peanut pasture.........................	177 pounds... 0.12 acre.....	2 22	.... 56.9
	Corn, 2-3............ } ½ ration.......... Cotton-seed meal, 1-3 } Peanut pasture.........................	{ 107 pounds.. { 51 pounds.... 0.08 acre	} 1 97 }	....
	Corn, ½ ration.......................... Peanut pasture.........................	162 pounds... 0.269 acre....	2 02	.... †27.7
	Corn, ½ ration.......................... Peanut pasture.........................	127 pounds... 0.209 acre....	1.59	.... †38.7
	Peanuts alone...........................	0.204 acre...	....	†50.8
	Corn, ½ ration.......................... Peanut pasture.........................	275 pounds... 0.201 acre....	3.44	.... †27.1
Alabama††........	Corn, ½ ration.......................... Peanut pasture.........................	189 pounds... 0.089 acre....	2.36	.... †78.4

* Bulletin 54.

† Assuming that 580 pounds of corn are required to make 100 pounds gain. (See Table 1.)

‡ Bulletin 143 (average of three years.)

** Bulletin 122.

†† Bulletin 83.

All of the above experimental work was done upon poor soils. The producing capacity of the Arkansas soil was about thirty bushels of corn, and that of the Alabama soil about twelve to fifteen bushels an acre. The Spanish variety of peanuts was used in all cases. If the soil upon which the nuts were grown had been good, better results could have been secured by using some of the larger varieties, but when the soil is poor, as was the case in all of the above work, too many empty hulls are produced when the larger varieties are grown.

In every case in the above table the peanuts were used profitably. In some cases one acre of peanuts took the place of eighty-five bushels of corn. In one case in Alabama one acre of peanuts took the place of only 18.4 bushels of corn, but even in that case the nuts were a profitable crop. It will be seen that where there was a fair crop of peanuts each acre was equal in feeding value to from twenty-five to forty bushels of corn. The average of the Arkansas work, where both corn and peanuts were used, shows that the corn sold for $1.44 a bushel (if it cost $8.00 to make the crop), while in the Alabama tests, where corn was used with peanuts, it brought $1.08 a bushel. In some of the Alabama work the corn returned a value of more than $1.25 a bushel. It should also be remembered in this connection that these hog-grazing crops do not cost a cent to harvest; the hogs save the expense by consuming the crops in the field. Again, when the hog grazes on the crop there is practically no danger of losing it on account of continued rain at harvest-time.

The above peanuts were all planted from May 1 to July 1. They were ready to graze from 90 to 120 days after planting.

Alfalfa.

Many sections of the South are admirably suited to growing alfalfa. When the farmer is so situated that he can sell alfalfa hay it may not be wise to keep the pasture grazed down with hogs, but at certain times of the year the pasture can be grazed without at all injuring the hay crop. Some farmers are so situated with reference to markets that it would be far more profitable to keep the alfalfa pasture grazed down by hogs than to undertake to make hay of it. It is one of the best pastures that can be secured, since it furnishes a large amount of feed to the acre and the grazing season extends over several months of the year.

One Hundred Acre Alfalfa Field.

Just seeded by Mr. James Bellwood, Chesterfield County.

While the rape pasture in the Kansas test proved to be a good feed to use along with the grain, the alfalfa pasture proved to be a little more than twice as valuable. One acre of rape was equal to 753 pounds of grain, while one acre of alfalfa pasture was equal to 1,544 pounds of grain. The pastures were grazed only ninety-eight days, whereas the alfalfa pasture, in the South at least, can be grazed for twice that length of time. When a price of $30.00 a ton is placed upon the grain used, an acre of rape pasture proved to be worth $11.29, while an acre of alfalfa pasture was worth $23.16.

In the Missouri test the alfalfa was cut and carried to the hogs which were confined in a dry lot. There were six hogs in the lot. They ate 463 pounds of green alfalfa in 102 days. The author, Dean H. J. Waters, writes:

"It was not expected that in ordinary farm practice the green material would be cut and fed to the hogs in this manner. At the time the experiment was undertaken, however, it was not feasible to fence off areas of each of these forage crops and graze them. Outside of the extra expense required for cutting and hauling this material to the hogs it was not considered that they would do so well on this material as if allowed to graze, for when grazing they would be able to select their material and would eat a larger quantity of forage than it was possible to get them to consume in a pen when it was cut and fed to them in the manner described. It is safe, therefore, to assume that our experiments show the minimum advantage of these forage crops, and that in actual practice a larger benefit would accrue from the use of these materials than our experiments show."

Sorghum.

Sorghum is a green crop well thought of in the South as a feed for swine. Its chief advantage lies in the large yields and the sureness of the crop, there being very few seasons in which it fails. But it must be remembered in planting a rotation of crops that sorghum is not a legume, so that the land will not be made better on account of its having been grown. It should also be borne in mind that corn and sorghum do not make up a balanced ration for animals. They are both low in protein, so if sorghum is to be used at all, the concentrate feed should be partly made up of a feed high in protein, as cotton-seed meal or tankage.

AMOUNT OF GRAIN TO FEED WHEN HOGS ARE ON PASTURE.

It would be of interest to the farmer to know just how much grain to feed along with the pasture crops. Of course the amount of grain fed depends upon the kind of pasture used and whether the animals are just "being carried along" or are being rushed to a finish. One or two stations have undertaken to answer the question. The Utah station has done several years' work in feeding hogs on a pasture made up of mixed grasses, consisting partly of alfalfa. The chief object of the work was to determine the proper amount of grain to use along with their pastures. The results were as follows:

TABLE 18.—*Work at Utah Experiment Station in feeding grain to hogs along with pasture*

RATION	Pounds of feed to make 100 pounds gain	Cost of grain for 100 pounds gain (grain $25 a ton)	Average daily gains
			Pounds
Full grain plus pasture	374	$4 67	1.21
Three-fourths grain plus pasture	354	4 42	1.01
One-half grain plus pasture	302	3 77	.75
One-fourth grain plus pasture	247	3 08	.55

No account was kept of the amount of pasture used by each lot, but it is fair to suppose that those lots which received light grain rations consumed more pasture than did the lots which received a heavy grain feed. But leaving the pasture out of consideration it is seen that the smaller the amount of grain used the cheaper and slower were the gains.

The Alabama station has done some recent work along the same line with soy beans as the pasture. Accurate account has been kept both of the amount of pasture consumed by each lot of hogs and the cost of putting in and cultivating the crop. Estimating rent at $2.00 an acre, it has cost the station $10.50 an acre to seed, fertilize and cultivate a soy bean crop. The average farmer can make the crop cheaper than did the station, as the farmer can secure labor more advantageously than the station could. The results secured at the Alabama station were as follows:

TABLE 19.—*Work at Alabama Experiment Station in feeding corn to hogs along with soy bean pasture.*

RATION	Average daily gains	Feed to make 100 pounds gain	Cost of grain for 100 pounds gain	Cost of grain plus cost of pasture for 100 pounds gains
	Pounds			
Three-fourth corn and soy bean pasture	1.67	130 pounds corn, 0.164 acre pasture.	$1 62	$3 34
One-half corn and soy bean pasture....	1.14	111 pounds corn, 0.206 acre pasture.	1 39	3 55
One-fourth corn and soy bean pasture..	1.30	54 pounds corn, 0.219 acre pasture.	.67	2 97

It is seen that while the cheapest gains were made by the lot receiving the smallest amount of corn, even when the amount of pasture used is also taken into consideration, still there was not a gradual decrease in the cost of gains as the amount of grain was reduced. The second lot, while producing 100 pounds of pork at a cheaper corn cost than the first lot, did not make pork as cheaply as the latter when the area of pasture consumed was taken into account.

Several points must be taken into consideration before one can determine what is the right amount of corn to feed along with pasture when hogs are being finished for the market. First, the condition of the hog at the end of the feeding period must be taken into account. If the animal is to be marketed directly off the pasture crop, it would no doubt, be profitable to feed him grain while grazing the pasture on account of the beneficial effect the added grain would have upon the carcass. This is desirable, because the hog which receives but a small allowance of grain in addition to a pasture comes through to the end with a big belly region which makes him dress a low per cent. Although he may gain as rapidly as the animal that receives more grain, he will not be in as acceptable killing condition as will the former, so the butcher will place a lower price upon the pasture-fed animal. Second the amount of corn at the disposal of the feeder must also receive consideration. When there are large amounts of corn upon the farm to be disposed of, there is no better way to market it than through hogs on pasture, so the problem may resolve itself into a question of finding a good and high-priced market for corn. When this is the case, it would no doubt be wise to feed the animals liberally of the corn, so that the supply may all be used before the spring months arrive. No farmer can afford under present conditions to sell his corn directly upon the market as corn, even for $1.00 a bushel. He should market it through hogs. In the Alabama test from $1.42 to $2.82 was secured for each bushel of corn fed when hogs sold for five cents a pound live weight. Some farmers hold that the most profitable method is to feed no grain at all while the hogs have the freedom of a good pasture, but it is seen from the above prices realized upon corn that the man who has corn to sell should make more money by feeding it in conjunction with the pasture. Third, the amount of available pasture will have something to do with the amount of corn to feed. If the area of pasture is small for the number of hogs on hand, it would pay to be liberal with the corn in order that the pasture may be extended over as long a time as possible. Fourth, the amount of grain used depends upon the length of time the farmer has in which to get the animals ready for the market. If prices are ruling low, it may be wise to simply carry the animals along slowly until the prices advance. If hogs are selling at a good figure and there is danger of their depreciating in value on account of prices falling, it would be the part of wisdom to finish rapidly through the liberal use of grain.

ROOT AND TUBER CROPS

It may be stated, as a general rule, that root crops can not be as profitably used for fattening hogs as can some of the crops heretofore mentioned. The South must adopt a system of farming that requires as little labor as possible, and when the root plants are grown much labor must be expended upon them. One of the advantages of stock farming is that it lends itself to handling large areas of land without a corresponding increase in the amount of labor used. If, through the addition of stock to our system of farming, we should materially increase the amount of labor required, the business could not be made a success, as there is but little extra labor to be had. Then, again, the effect of the crop upon the soil should never be overlooked. The common root crops now in use are not legumes, so the soil will not be improved as a result of their having been grown. Nevertheless some farmers are so situated and their soils are of such a character that they can probably use root crops to advantage.

CROP SUCCESSION FOR HOG FEEDING.

There has been no effort to present in the preceding pages all of the summer growing plants that can be used for grazing hogs. Only a few of the most prominent ones have been brought to the reader's attention. The farmer who knows his own conditions and his own soil can introduce into his cropping system many plants that have not been mentioned at all. The following table gives data concerning a number of suitable plants.

TABLE 21.—*Summer and fall growing crops suitable for hog raising.**

Crop	Time to Plant	Amount of Seed to the Acre	Number of days from planting to grazing time
Alfalfa	Feb. 25–Apr. 1	15–25 pounds	75– 90
Chufas	Mar. 15–June 1	3–4 pecks	120–150
Cowpeas	May 1–July 10	½ bushel (drilled), 1½ bushels (broadcast)	75– 90
Soy beans	Apr. 1–June 30	½ bushel (drilled), 1½ bushels (broadcast)	90–120
Japan clover	Mar. 1–Mar. 15	24 pounds	60– 75
Oats	Feb. 1–Mar. 20	1½–3 bushels	75– 90
Peanuts	May 1–July 1	1–2 bushels (not hulled)	90–120
Rape	Mar. 1–Mar. 31	4–6 pounds (drilled), 9–10 pounds (broadcast)	60– 75
Sorghum	Apr. 1–July 1	1½–2 bushels	60– 90
Velvet bean	May 10–June 20	1½ pecks (in drills)	100–130

* Alabama Bulletin 143.

FINISHING HOGS AFTER PASTURE CROPS ARE EXHAUSTED.

The majority of the farmers of the South who make use of green crops for fattening hogs dispose of the animals when the crops are exhausted without finishing them upon grain for a short period in a dry lot. There is a time when the hog should be penned up in a lot and fed grain alone, but that time is not at the beginning of the feeding operations. He should be penned up after the pasture crops are gone and fed grain alone for a few days before slaughtering or marketing. There are several reasons for following this plan. First, the hog after coming off the pasture is in just the proper condition to make gains economically and rapidly for a short time. He is in excellent health, active, and, as a rule, his frame is not covered with as much fat is it should carry. The pasture has tended to develop his frame at the expense of fat, especially if he is a young animal. After he is fed in a pen from twenty-five to twenty-eight days he looks better, and is better, than when he came off pasture, and is actually worth more to the consumer or butcher as he is fatter and will dress out a higher percentage of good marketable meat than if he had been sold directly from the pasture. Second, when hogs have been grazed upon peanuts, soy beans, and certain other green crops, the meat and lard have become soft, which makes the animal objectionable to the butcher as well as for home consumption. This soft meat can be hardened very materially if the hogs are fed upon grain for only a short period after the crops are exhausted.

What shall the animal be fed during this short dry-lot finishing period? Corn is good; corn in combination with cotton-seed meal is better and is cheaper than corn alone, as the addition of cotton-seed meal to the ration renders the meat hard more rapidly than when corn alone is used. *If the animals are to be fed not more than twenty-one days* in this finishing period one-third of the total ration may be made up of cotton-seed meal. If it is likely that the last period will be extended over more than twenty-one days the proportion of cotton-seed meal should be *cut down to one-fifth or one-sixth of the whole ration,* and the finishing period extended not beyond five weeks in all.

INCREASE IN SOIL FERTILITY DUE TO GRAZING HOGS.

Inasmuch as green crops suitable for hog feeding can be maintained in the South practically every month in the year, it is possible for the southern farmer to make more money than the northern farmer upon hog-producing operations, and the profits made are in proportion to the amount of green crops used. But in addition to making ready money on the hogs themselves the farmer who grows leguminous crops and grazes them off with hogs has a fertilizer factory on his own farm.

BREEDS OF SWINE.

The question is often asked, What is the best breed of swine for the South? The answer can not be given by naming any one particular breed; there is no such thing as a "best" breed. One breed may be specially adapted for a certain purpose, while another may be better suited for a different object. The best breed for any particular farmer is usually the breed that he likes best.

The breeds of hogs are divided into two general classes, the bacon type and the lard type. The Yorkshire and the Tamworth breeds belong to the bacon type, while other breeds, as the Berkshire, the Poland-China, and the Duroc-Jersey, belong to the lard type.

CONCLUSIONS.

1. Hogs can be raised at a profit in the South, and southern farmers should raise more of them.
2. Hogs can not be raised profitably on corn alone.
3. While pork can sometimes be made at a profit when corn is supplemented with nothing but a concentrated feed, still it is not wise to use concentrated supplements alone.
4. Hogs can be produced cheaper when pastures are used along with the grains than when grains are used alone. By means of pasture crops pork can be made cheaper in the South than it is possible to make it in the corn belt.
5. The advantages arising from the use of pastures are:

Pork costs only one-third to one-half as much when pastures are used as when concentrated feeds alone are used.

The soils are improved very materially as a result of growing the legumes for the hogs and feeding extra grains to the animals.

The crops are harvested (through the hogs) without danger of loss from rains and without expense.

The hogs are under favorable health conditions; therefore losses from disease will be lessened.—*Part of U. S. Bulletin 411.*

GROW MORE COWPEAS.

Our Virginia farmers are growing more each year that great soil improving crop, the cowpea. They will be interested in a recent bulletin of the North Carolina Department of Agriculture on the culture of the cowpea. This bulletin reports some experiments with cowpeas conducted by Mr. B. W. Kilgore, director of test farms, and others. Among the recommendations made as to the cultivation of cowpeas as a result of these experiments are the following:

Thirty-one varieties of peas, embracing the main ones grown in North Carolina and adjoining States, as well as many of the less important ones, have been tested on the Iredell Farm during six years. The results obtained and observations reported include yields of peas, hay, time to mature peas and hay, and character of growth of plant. For the varieties grown four years or more the following average data were obtained:

The average yield of peas varied from 6.6 bushels to 13.5 bushels per acre, the rank in order of productiveness being as follows:

Whittle,
Small Black,
New Era,
Whippoorwill,
Sixty-day,
Red Crowder,
Southdown,
Iron,
Large Black Eye,
Powell's Early Prolific,
Small Black Eye,
Small Lady,
Red Ripper,
Yellow Sugar Crowder.

The number of seed per pound varied from 1,814 with the Large Black Eye to 3,856 with the Iron. This is a measure of the size of the peas and is a factor which is of interest in determining the quantity of peas to be planted per acre.

The yield of hay varied from 2,400 to 3,872 pounds for the varieties tested four years and over, the rank in order of productiveness being as follows:

Iron,
Clay,
Brown Coffee,
Whippoorwill,
Red Crowder,
Red Ripper,
Yellow Sugar Crowder,
Small Black,
Whittle,
Southdown,
New Era,
Small Lady.
Powell's Early Prolific,
Small Black Eye,
Large Black Eye.

To this should be added that the largest yield of hay from any of the varieties was from the Unknown, the average for three years being 5,200 pounds, or 2.6 tons.

For both peas and hay, the following are shown to be excellent kinds:

Whippoorwill,
Red Crowder,
Iron,
New Era.

For soil improvement the varieties which produce the largest yields of hay and peas combined are best, and the following varieties are specially desirable for this purpose:

Unknown,
Iron,
Clay,
Brown Coffee,
Whippoorwill,
Red Crowder,
New Era.

When sown broadcast or drilled with grain drill, one bushel of peas makes a good seeding. Our experiments show that when planted in three and one-third foot rows, one-half bushel produces practically as large yields as one and one-half bushels per acre. When planted in rows it pays to cultivate two to three times.

On heavy land small crops of peas may be turned under green and improve the physical condition of the soil, in addition to adding the fertilizer constituents contained in the crop. On light soils it is likely best to allow the vines to die and partially decay on the soil and turn under during the winter or early spring. This is good practice on all kinds of land, and especially with large crops. Any loss from remaining on the land during the fall and winter will likely be overcome by the prevention of washing. Where it is desired to use the land in the fall for small grain the peas may be cut up with a disk harrow or other implement and allowed to wilt and dry on the soil and then be turned under. If this can be done some time in advance of planting, so as to allow the rains to settle the soil, or else do so by harrowing and rolling, good results will follow.

EXPERIMENTING WITH FERTILIZERS.

There is no way to tell without experiment what food constituent a soil lacks. The crops themselves give valuable suggestions. As a rule, lack of nitrogen is indicated when plants are pale green in color, or when there is a small growth of leaf or stalk, other conditions being favorable. A bright deep green color with vigorous growth of leaf or stalk is, in the case of most crops, the sign that nitrogen is not lacking, but does not necessarily indicate that more nitrogen could not be used to advantage. An excessive growth of leaf or stalk accompanied by imperfect flower and fruit development indicates too much nitrogen for the potash and phosphoric acid present.

When such crops as corn, cabbage, potatoes, and so forth, have a luxuriant healthful growth, an abundance of potash in the soil is indicated, also, when fleshy fruits of fine texture and flavor can be grown. On the contrary, when these plants, fail of luxuriant growth, or are very low-grade in quality, it is a certain indication that potash is lacking. When the soil produces good, early maturing crops of grain, with plump and heavy kernels, phosphoric acid will not generally be found deficient in the soil.

In order, therefore, to ascertain with greater certainty what food constituents are lacking in any particular soil, the surest, in fact, the only way is for each farmer to conduct experiments on his own soil and crops. The results can then be studied and the yield of crop ascertained. In carrying on such experiments, several difficulties may be met. The season may frequently be such as to interfere seriously with the favorable action of the fertilizers applied. Thus, severe drought may counteract all other conditions and prevent a satisfactory yield. The difference in the mechanical condition of the soil of the same farm, or even of the same field may prevent a fair comparison of the action of the different kinds of fertilizing materials. A late, wet spring may also interfere. But, notwithstanding these difficulties, valuable suggestions will be obtained from an experimental study of one soil through the behavior of the crop.

PROFITS IN GROWING SHORT-LEAF PINE.

Thinning old field stands of short-leaf pine while the trees are small will more than double the yield and value of such stands when the trees are large enough to cut for saw timber. These are the conclusions reached by W. W. Ashe, of the United States Forest Service, after spending some time investigating this tree in Middle Virginia. His report of the short-leaf pine, prepared under the direction of the Forest Service, will soon be published by the Virginia Department of Agriculture as a special report, and can be obtained by applying to Hon. G. W. Koiner, Commissioner of Agriculture.

Since there are more than 3,000,000 acres of second-growth short-leaf pine on the farms of Middle Virginia, any method of thinning the stands or of handling the timber to increase the profit of timberland should be welcomed by farmers and landowners. The most noteworthy fact developed by Mr. Ashe's investigation is the accelerated growth and increased yield which result from thinning crowded stands. Average crowded stands when forty years old yield only about 6,000 board feet to the acre. If such stands are systematically thinned, a yield of 15,000 board feet an acre, in addition to the trees removed in the thinnings, can be obtained in forty years. The most profitable method of thinning is described in detail in the report.

The report further shows that unthinned and neglected stands forty years old are paying, by growth, less than two per cent. on the investment if stumpage sells at $2.00 a thousand board feet and if the land has a value of $5.00 an acre. If stumpage sells for less, or if land has a higher value, less than two per cent. a year is earned. Stands of this character are of course unprofitable. If stands are thinned and properly managed, they will pay more than 4 per cent. net, or as well as a State bond. The yield in cordwood is likewise largely increased by thinning.

The report also explains the most profitable age and size for cutting stands of short-leaf pine. The maximum annual yield is obtained from a crowded stand by cutting it when the trees average about twelve inches in diameter on the stump; that from a thinned stand by cutting when the trees are half an inch larger. If a thinned stand is cut when the trees are twelve and one-half inches in diameter, with a land value of

$5.00 an acre and an income rate of four per cent., it will have cost two dollars ($2.00) a thousand to grow it; if cut ten years before the trees reach this size, it will have cost about $2.70; if cut ten years after reaching this size, $2.70 also; and if cut twenty years after, $4.10 a thousand. The reason for these differences in the cost of growing timber and the method of ascertaining the cost of growing are explained in detail for cordwood as well as for saw timber. The possible profits from planting waste land are also shown. Methods of protecting young stands from fire, of combating insect depredations in old stands, and of obtaining after cutting a heavy stocking of young pine in place of oak, which usually follows pine, are explained.

There are about fifteen other very important species of trees occurring in Virginia which could be investigated profitably in the same manner as the short-leaf pine. Also, since the data for the short-leaf pine was obtained in only one section of the State, it would be desirable to ascertain if the same methods of cutting it apply to other sections, and if not, to ascertain the profitable size and age for cutting.

ORGANIZE A FARMERS' CLUB.

Every farmer and his family should be a member of some club or society composed of the people in his vicinity. These meetings are enjoyable and profitable; they give variety and change in the everyday life on the farm, and they are helpful and profitable to the farmer in the discussion of farm subjects.

HOW TO ORGANIZE A FARMERS' CLUB.

In many localities the only thing that hinders the organization of a farmers' club is a lack of confidence on the part of interested persons, in their own ability to start the ball rolling. Each waits for someone else, thinking that others are more capable of taking hold and doing things in a correct manner.

This is generally a mistake, as it is nearly always true that the ones most interested in a work are the ones who will do it best, regardless of their general qualifications for leadership. As to the organization of a farmers' club, nothing can be more simple, and anyone who is willing to take a little trouble can easily accomplish it.

The first step is to call together all those known to be interested in the general welfare of the community. The matter can then be presented and discussed. This is usually best accomplished by a personal invitation to such parties to meet at one's own home, in an informal way for the purpose of talking over the subject. More people will accept such an invitation than will usually respond to a call for a formal meeting.

After giving these invitations, as much pains as possible should be taken to gather information on every phase of club work, its purpose, method, influence, etc. Then material will be at hand from which to answer the questions sure to come up along these lines. Too much stress cannot be laid upon this one thing, as most of the interest will depend upon a knowledge of these very things.

If possible, organize in some form, however incomplete, at the first meeting. It is easier to push the work if some kind of a center is established at once. If nothing more is possible, elect a temporary chairman, and adjourn to meet at some definite time and place. If at all possible, the full quota of officers should be elected at the first, or at farthest at the second meeting.

These officers should consist of a president, vice-president, secretary, treasurer and lecturer. A chaplain is also desirable, but may be omitted from the regular list if it is thought better to depend upon visiting clergymen, or others, for conducting the regular devotional exercises. More will be said later regarding the duties of these officials.

If it is not thought best to elect officers at the first meeting, the temporary chairman will do well to appoint a committee on nominations, who should be ready to report on a list of desirable candidates at the next meeting. Often the initial meeting will not be comprehensive enough to include the best material in the vicinity for these officer. If it is known that any person not present is especially well qualified for a certain position, an attempt should be made to gain his interest and insure his attendance at the next meeting. In such a case, the election is better left open for the time.

The officers, particularly the ones first elected, should be chosen so as to represent the whole range of territory to be covered by the club. In this way the interest in and influence of the club will branch out over a wider area than if these officers be all chosen from some one section.

The membership, for the time at least, should include all who wish to join, no matter from what distance they may come. After the work is fully established it is often better to break the larger aggregate up into several smaller units, for the sake of convenience in attendance, entertainment, etc. Then, too, smaller bodies are easier to handle, and will often work to better advantage than if an attempt is made at centering too large a section in one place. Moreover, each club will be likely to follow some certain phase of work, and, by thus spreading out, a greater variety of ends may be accomplished. Visiting neighboring clubs should be a regular privilege extended to all club members, and, as the work progresses, it is a good thing for each club to send an occasional delegate to other clubs near by to observe and report on any new methods and plans they may be following.

One limitation, however, should be placed upon the membership list, it should include only those who are actively interested in farming—those who live on farms, or those who may own them, although residing in town. In every case a lively interest in the bettering of farm conditions and adding to the pleasure of rural life should be made a condition of active membership. Local pastors, teachers and editors are usually broadminded enough to be valuable acquisitions to any body, and may be put upon the honorary membership list if desired.

The family should be regarded as a unit of membership. It should be represented on the list by the name of its head, but should be understood to include every member of the family, as well as any person making his or her home under the same roof. Voting privileges may be confined to those over eighteen years of age.

In electing officers the best material in the club should be utilized for president and lecturer, as upon these two offices depends chiefly the interest and proper conducting of the club work. The president should, if possible, be a man who has had a little previous experience before the public, or has been used to handling public assemblies. Very often, however, men who have had no previous experience whatever, but are deeply interested in the work, develop into the best possible presiding officers. Too great care cannot be taken in the selection of this official, as he must be capable of meeting any emergency, arousing interest and guiding the general tide of the meeting into safe and profitable channels. He must be ready to fill any gap with some suggestion, or to appoint some well-qualified person to do so. He must, more than all, be a man who can guide a discussion away from improper, tedious or rambling subjects without giving offense to anyone. He is the center of the club life, and must be a man of both vigor and tact.

The vice-president should be chosen with reference to the same qualifications, as it may be necessary at some time for him to fill the presidential chair. Some clubs make a practice at each new election of voting the old vice-president into the first place, arguing that his year in the secondary office is the best preparation for the presidency. Whether this is advisable or not depends largely upon circumstances that each club must decide for itself.

The secretary may be chosen from among the ladies of the club. Usually a farmer's wife can get more time than her husband, and is better qualified for the attention to the many small details of this office. It is well to consider the amount of leisure at the candidate's disposal in making nominations for this office, as it takes considerable time to properly attend to all the writing and other matters that are necessarily a part of its duties. Many clubs divide this work by electing both recording and corresponding secretaries, and this is a very good plan if the membership is large.

The treasurer's first qualification is, of course, honesty, but this needs little emphasis, as few will be found in such an organization who are lacking in this respect. This is a good office for a young man—and it may be remarked in passing that just as many young people as possible should be encouraged to take part in the club work.

The lecturer should be the brightest, most wide-awake and most popular man the club affords. The duties of this office are many and varied, including nearly everything that cannot be properly relegated to some other. But there is no office in the club that is so pleasant to fill. In this respect it is its own reward for the effort it requires to properly carry it out.

The lecturer should be on the watch for any new idea, plan or method that has any bearing whatever on the bettering of conditions, either in the club or in the community at large. He should be prepared at each meeting to take up some new topic of general interest and handle it from every point of view in so far as it touches the before-mentioned conditions. He should make it his especial mission to visit other clubs and glean all the new ideas possible from their method of work. It should be his business to keep the club from getting into a rut, by the constant application of new methods and material and the remodeling of old ones. He needs the hearty co-operation of all the other members, and should be authorized to call upon any of them for such aid as he may require at any time.

Immediately after his election the President should appoint two committees of three members each to arrange the literary and musical parts of the program for each meeting. The literary committee should have authority to appoint any members of the club for whatever work on the program they are thought best qualified to fill. The committee should be careful in assigning work to fit each member's ability as nearly as possible. It should be ruled that no excuses should be accepted unless in extreme cases, such as sickness, or unavoidable absence, and then that the member to whom the work has been assigned shall furnish a substitute. The real value and pleasure of the club work is best had when each does his or her part cheerfully and willingly, to the very best of his ability.

The music committee should arrange the musical part of the program according to a similar plan. The music should be made as prominent a feature as possible of each session, as it is sure to be enjoyed by every one.

These committees should meet monthly, between the club meetings, and make out the program, which should be announced at each session for the one of the following month. The committees may meet together or separately, as most convenient, and the lecturer may or may not be an ex-officio member of one or both. At any rate, he should keep in close touch with both.

Following is a program that may be taken as a sort of guide for an ordinary club meeting. It may be varied and rearranged to suit circumstances and material.

Call to order by the president.
Opening song by club.
Devotional exercises.
Roll call, conducted by secretary.
Music, vocal or instrumental, by local talent.
Regular business meeting, conducted by president.
Minutes of last meeting read by secretary.
Unfinished business.
New business.
Reports of regular and outstanding committees.
Song by club.
Intermission. If the session is to last all day, this opportunity may be taken to serve dinner. If not, a few minutes is sufficient.
Call to order.
Song by club.
Lecturer's talk or report.
This may be followed by discussions suggested by the report.
Recitation. The younger members, and especially children, may be assigned for this and similar topics.
General topic for discussion.
The leader of this topic should be appointed by the Literary Committee, and a general discussion should follow.
Select reading.
Music by local talent.

Recitation.

Paper, preferably by a lady member, on some topic relating to housekeeping or home-making.

Crop report. Here let each farmer present tell of the general progress and condition of his crop.

Question box, in charge of lecturer, or some one, appointed by him. At this time may be taken up any question of general interest, or upon which information is desired.

Song by club.

Adjournment.

The more music that can be supplied the better. At some meetings the bulk of the program can be given to the children, at some to the mothers, and at others, to the young folks. An effort should be made to vary it as much as possible without omitting the items of main importance.

From the first an effort should be made to prevent discussions in the club of subjects outside those of regular farming interest. Especially should this caution apply to those which, like religion or politics, are likely to prove interruptive of peace and unity. Not that the subjects mentioned are totally inadmissible, but they should be kept to strictly general boundaries, if admitted at all. The questions of politics here is not meant to include the discussion of any pending legislative measures, as it is always of great advantage to have these fully talked over and understood. But the club should not give any opening for its manipulation as a tool in the interests of any political party or religious denomination. It is meant for all alike, and should be kept as free as possible from prejudice regarding matters of purely personal belief. It should stand freely for the best part of the moral and intellectual life of the whole community, and so must represent the whole without partiality.

Among the questions that should be settled at the earliest sessions of the club are those of the time, frequency and places for the meetings, the serving of refreshments and other minor details that effect each club according to its own circumstances. Once a month is usually considered often enough for the meetings to be held, on some regular date, such as the first Tuesday or second Wednesday in each month. From April until September the days are long enough to permit of afternoon sessions, if desired, but for the remainder of the year it is better to meet during the forenoon and adjourn at about 4 p. m. As to the place of meeting the practice of holding house-to-house sessions is far the pleasantest, but in unusual cases a hall or other central point might be preferred as a regular meeting place. Going from one neighbor's house to another gives the friendly, social air so desirable in an organization of this kind that can be had in no other way.

The question of refreshments must be settled by the ladies of each club for themselves. Each hostess may entertain in turn, furnishing the simple lunch, or a basket dinner or supper may be carried each time. In any case this feature should be kept as simple and inexpensive as possible. It is a good plan to limit the amount to be served and then require each to conform to the regulations. In this way no spirit of outdoing one's neighbor is engendered, and every one shares alike

ENEMIES OF MELON AND CUCUMBER.

Three serious enemies the grower of muskmelons must be prepared to fight, if he would grow a full crop of the best quality. These enemies, in the order of their appearance, are: the striped cucumber beetle, the melon aphis or louse, and the leaf-blight, or rust.

STRIPED CUCUMBER BEETLE.

The small, yellow and black striped beetle, which commonly attacks cucumbers, melons and squashes, may be expected every year; however the severity of the attack varies in different sections and in different seasons. The melon plants are attacked as soon as they are above ground, and unless prompt treatment is given, the entire field may be destroyed. The injury caused by these beetles is three-fold. First, the mature beetles feed mainly on the underside of the seed leaves and on the stems; second, the larvae, or worms, feed upon the roots; third, the mature beetles are supposed to carry the bacterial disease, that causes the sudden wilting of melon vines, from infected plants to healthy hills.

The fact that the mature beetles feed as a rule on the underside of the leaves and the stems makes the task of poisoning them with the arsenical poisons, as with the potato beetle, difficult, so that as a rule other measures are resorted to. Although many remedies and preventive measures have been proposed and are in use against this pest, there is no one specific remedy.

PLANTING EXCESS OF SEED.

A practice with many growers is to plant an excess of seed on the theory that the beetles will destroy some plants any way, and that enough plants may be left to make a full stand. A modification of this practice is the plan of making successive plantings in different parts of the hill. It is usually unnecessary to replant more than three times, and, after danger from the beetles is passed, the plants can be thinned to the required number.

Growers who start their plants under glass either in hotbeds or in the greenhouse are usually less troubled with the beetles, because the plants in the frames or house can be easily protected, and when set in the field are strong enough usually to resist the attack of the beetles.

The use of trap crops, such as squashes, gourds or beans planted before the melons, is followed by some growers. The beetles will congregate on the trap crops and then be easily destroyed by the use of a spray of kerosene.

Other growers recommend the use of coverings of cheese cloth, mosquito netting or similar materials to protect the plants when they are small. Two half hoops placed over the hill at right angles to one another or two wires bent in a semi-circle and similarly placed are used to hold up the cover, which must be held down at the edges by a little soil. This practice, however, involves much labor on a large scale.

USE OF REPELLENTS.

The most common method of controlling the beetle is the use of repellents. It is said that the beetles do not like plants the foliage of which is covered with dust. Therefore, many growers cover the low growing plants with sifted wood ashes, road dust or land plaster. Some add turpentine or crude carbolic acid to the dust, as the odor of these is said to be distasteful to the insect. Some growers carry a sieve into the melon field and sift fine soil over the plants. Tobacco dust, sprinkled over the plants and on the soil, is also advised as a remedy. A variation of this practice is to sift the dust on only one part of the plants and cover the remaining plants with a solution of Paris green or other arsenicals in proportion of one-fourth of a pound to about sixty gallons of water.

DILUTE BORDEAUX MIXTURE.

Prof. J. W. Lloyd, of the Illinois Experiment Station, reports the successful use of dilute Bordeaux mixture as a repellent. The first application is made as soon as the plants appear above ground, whether any beetles are present or not. To effectively protect the plants it may be necessary to spray them every three or four days for a period of three or four weeks. Usually four ounces of Paris green are added to each 50 gallons of the Bordeaux for the purpose of poisoning any beetles that refuse to leave the plants. Where spraying for the leaf-blight is practiced this seems to be the most practical method of controlling the beetle. It must be remembered, however, that the secret of success in the use of Bordeaux and other preparations as a repellent is to keep the vines covered, and in rainy weather many applications may be be necessary.

Some tests have been made of the use of arsenate of lead as a remedy for the beetle. The usual practice is to use this at the rate of two pounds in a fifty-gallon solution of Bordeaux mixture. It has also been suggested that where the plants are transplanted tests should be made of the value of Bordeaux and arsenate of lead and of arsenate of lead alone as a dip for the plants before setting out.

The New Jersey Experiment Station has found that sweet potato plants may be protected against the sweet potato flea-beetle by dipping the plants before setting into a mixture of one pound of arsenate of lead in ten gallons of water. It is said that this material will not hurt the sweet potato plants, no matter how liberally it is used. Their leaves and stems should be completely submerged and thoroughly wet; the roots need not and should not be dipped. In the experiments with this remedy for the sweet potato flea-beetle it was found best to allow the plants to dry a little before setting. A similar treatment of melon plants might be effective in controlling the striped cucumber beetle. At any rate, growers should be willing to run the risk of losing a few plants to determine the effectiveness of the dip.

It should be remembered in this connection that it is always well to have the plants growing thriftily and that a crop that is heavily manured and frequently cultivated will be in better shape to withstand the attack of the beetles.

Spraying Cantaloupes with Bordeaux Mixture has Increased the Melon Crop from 3,000 to 8,000 per Acre.

FERTILIZING ASPARAGUS.

Growing asparagus is very profitable when well done—the yields are often enormous. As much as $5,000.00 have been sold from ten acres in one year.

The time of applying manure on asparagus beds, and the position where it should be placed, are of some importance. In the use of stable manure both writers upon the subject and growers actually engaged in producing asparagus for the market almost unanimously state that "in the autumn, after the stalks have matured and have been cut, manure should be applied on top of the rows." Some give the caution not to put it just over the crowns, lest the shoots next Spring be injured by contact with it.

This plan of top-dressing beds during the autumn or early winter is giving way to the more rational mode of top dressing in the spring and summer. It was believed that autumn dressing strengthened the roots and enabled them to throw up stronger shoots during the following spring. This is a mistake.

It is during the growth of the stalks after the cutting season is over that the crowns form the buds from which the spears of next season spring, and it is probable that it is principally during this period that the roots assimilate and store up the material which produce these spears. This being true the plant food added to the soil and becoming available after the cessation of vegetation in the autumn, can have little, if any, effect upon the spears which are cut off for market the following spring; it first becomes of use to the plant after the crop has been cut and the stalks are allowed to grow. Thus the manuring of the autumn of 1910 will not benefit the grower until the spring of 1912. In the use of hot, or fresh manure it may be that the winter season is too long to permit the fertilizing elements to become available and well distributed throughout the soil, but if well-rotted manure is used there is danger of the fertility being leached out of the soil by the rains and melted snows of winter.

The writer suggests feeding when the roots can absorb the manure instead of placing a large quantity of it over them after the growing season, when the plant is at rest. Those growers who apply a liberal dressing of stable manure or fertilizer immediately after the cutting season supply the required nourishment to the plants at the time they most need it and can most profitably utilize it in the production of spears. Manure thus applied will also act as a mulch, preventing the growth of weeds, keeping the soil light and cool, and preserving the moisture intact. It should not be made on top of the row. This suggestion the writer wishes to emphasize.

Manuring in November in many cases does more harm than good as the mass of manure causes many roots to decay, and those which do survive are weak and only produce small spears. It would be much better to rely upon liberal supplies of food through the growing season than to give manure when the bushes are cut, as at the former period the roots can more readily absorb the food given. By feeding in spring and summer the crowns are built up for the next season's

A Row of Bearing Trees in the Rose Cliff Orchard.
The estimated value of this year's crop from 100 acres is $35,000.

supply of grass. The roots of the asparagus are perhaps always active, but much less so in winter than at any other season, and they will obtain as much nutriment from the soil as they can then use. If heavily covered with manure sunshine is excluded, growth is checked, and the roots have to fight hard for existence at a time when they are none too strong.

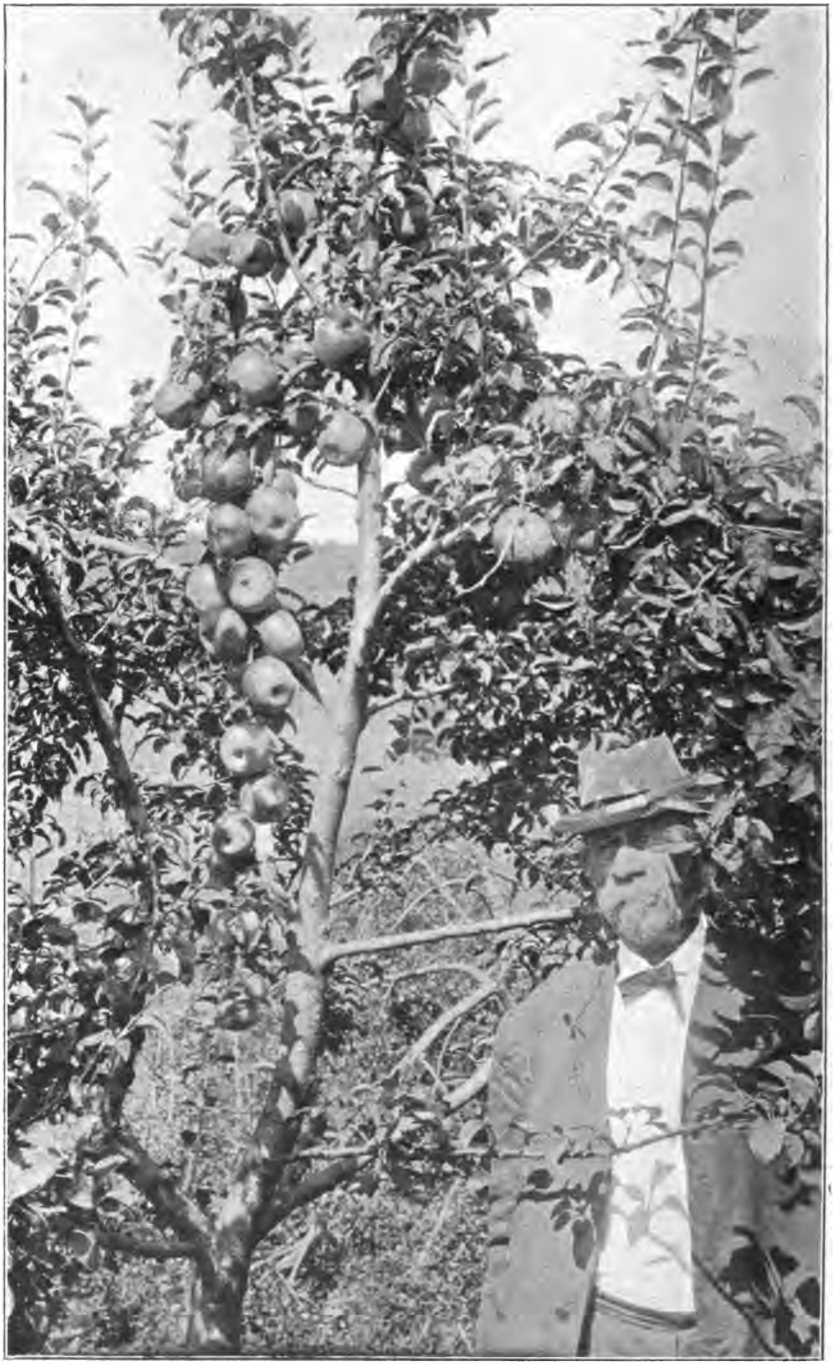
In the culture of green spears the manure is best utilized by broadcasting, this application to be followed by a thorough harrowing of the field. When white asparagus has been cut, either manuring in the trench between the ridges before disturbing them or harrowing down the ridges and then manuring broadcast is perhaps the most rational way.

As between manuring in the row and between the rows, the latter should be selected as the evidently advisable one by which the feeding roots of the plants are most easily reached. Placing the manure in the row only reaches those feeding roots which are to be found about midway between the crowns, as just around the crowns are nothing but storage roots, besides it is not desirable to place manure too close to the crowns; but manuring between the rows puts the manure right where the summer rains can carry the fertility directly down into the (as it were) open mouths of the feeding roots. H.

A COMPARISON OF TILLAGE AND SOD-MULCH IN AN APPLE ORCHARD.

In Bulletin 314 an attempt is made to answer the question as to whether the apple thrives better under tillage or in sod. The method of tillage chosen for the experiment was to plow in the spring, cultivate until late July, and follow with a clover crop. The sod method chosen was that known as the sod-mulch method in which the grass is cut as a mulch. The experiment was begun in 1903 in the orchard of W. D. Auchter, near Rochester, New York. This orchard consists of nine and one-half acres of Baldwin trees set in 1877, forty feet apart each way. The number of trees in the sod plat is 118; in the tilled plat, 121. In topography the Auchter orchard is rolling. The soil is a Dunkirk loam to a depth of ten inches, underlain by a sandy subsoil. The trees in the two plats received identical care in all orchard operations excepting soil treatment. The grass in the sod plat was cut twice in three of the five years, in the other two but once. The tilled land was plowed each spring and culitvated from four to seven times. Statements of results follow:

The average yield on the sod plat for the five years was 72.9 barrels per acre; for the tilled plat, 109.2 barrels; difference in favor of tilled plat, 36.3 barrels. Estimates made at blooming and fruiting time showed a far greater number of fruits on the tilled trees. Actual count showed 434 apples per barrel on the sod land weighing 5.01 ounces each and 309 apples per barrel on the tilled plat weighing 7.04 ounces each. The fruit from the sod-mulch plat matures from one to three weeks earlier



Thirty No. 1 York Imperial Apples Grown on a Small Limb about Three Feet in Length in Senator Keezell's Orchard.

than that on the tilled plat. In common storage fruit from the tilled plat keeps four weeks longer than that from the sod plat. In cold storage, the keeping quality of the two fruits is the same. The tilled fruit is decidedly better in quality, being crisper, more juicy and of better flavor. The advantage of tillage over the sod-mulch in the matter of uniformity of trees and crops is marked. The trees in sod showed abnormalities in foliage, branches, roots and particularly in fruit-bearing and in fruit characters. The average gain in diameter of trunk for the trees in sod for the five years was 1.1 inches; for the trees under tillage 2.1 inches; gain in favor of tillage, 1 inch. The dark, rich green color of the foliage of the tilled trees indicated that the tilled trees were in the best of health. The leaves of the tilled trees were much larger and much more numerous. Leaves from sodded trees and the same number (2,400) from tilled trees were weighed and gave 8.7 grams as the average weight per leaf for the sodded trees and 11.5 grams for the tilled trees. The leaves of the tilled trees came out three or four days earlier and remained on the trees a week or ten days later than on the sodded trees. The average annual growth of branches for the sodded trees was 1.9 inches; for the tilled trees 4.4 inches. The average number of laterals per branch on the sodded trees was 3.4; on the tilled trees 6.7. The new wood on the tilled trees was plumper and brighter in color, indicating better health. The amount of dead wood in the sod-mulch trees was much greater than in the tilled trees. The roots of the trees in the sod-mulch plat came to the very surface of the ground. In the tilled land the roots were found in greatest abundance at a depth of from three to ten inches. The circumference of the root systems in the tilled trees is approximately circular, but the circumference of the roots of the trees in the sod is very irregular, indicating a reaching out of a part of the roots in response to a demand for more moisture, food or air. The average cost per acre for the two methods of management, not including harvesting, was $17.92 for the sod; and $24.47 for tillage, giving a difference of $6.55 in favor of the sod. The average net income per acre for the sod plat was $71.52; for the tilled plat, $110.43, a difference of $38.91 in favor of tillage, an increase of 54 per cent. for tillage over the sod-mulch method of management.

Tillage seems to be better than sod for the apple for the following reasons: The results of 120 moisture determinations in the Auchter orchard show that the differences in tree growth and crop in the two plats of this experiment are mainly due to differences in moisture, the tilled plat having most moisture. As a consequence of the reduced water supply in the sod plat, there is a reduced food supply; for it is only through the medium of free water that plants can take in food. Analyses show that the differences between the actual amounts of plant food in the two plats are very small. Analyses show that there is more humus in the tilled plat than in the sod plat, contradicting the oft-made assertion that the tillage method of managing an orchard "burns out the humus." At a depth of six inches, the tilled soil in 1.1 degrees warmer in the morning and 1.7 degrees at night, than the sod land; at twelve inches the tilled soil is 2.3 degrees warmer in the morning and 1.8 degrees in the evening. We are justified, without the presentation of specific data, in saying that a tilled soil is better aerated than a sodden land.

Soil investigators are well agreed that beneficial micro-organisms are found in greater numbers in a cultivated soil than in other soils.

The following application of the results of this experiment may be made: Nearly all the plants which minister to the needs of men are improved by tillage; the apple does not seem to be an exception. Results as positive as in this experiment can be made very comprehensive; they should apply to all varieties of apples and to nearly all soils and locations. The experiment does not show that apples cannot be grown in the sod; it suggests, however, that apples thrive in sod, not because of the sod but in spite of it. While moisture is by no means the only factor to be considered in the controversy over the sod and tillage methods of managements, it appears to be the chief one. There is nothing in this experiment to indicate that trees will become adapted to grass.—*New York Agricultural Experiment Station.*

SPRAYING CALENDAR.

1 OYSTER SHELL BARK LOUSE—
  Plant attacked—Apple, mainly.
  What to Use—Sulphur-lime.
  When to Use—When the leaves are off the trees.
  Note—If this spraying is ineffectively done, apply kerosene emulsion or whale-oil soap when eggs hatch.

2 SAN JOSE SCALE—
  Plant Attacked—Nearly all deciduous trees.
  What to Use—Sulphur-lime.
  When to Use—In the spring before the buds burst.

3 RED SPIDER—
  Plant Attacked—Fruit trees and bushes.
  What to Use—Sulphur-lime.
  When to Use—In the spring before the buds burst.
  Notes—This will kill the winter eggs. If the mite appears in summer, use kerosene emulsion, best adding 1 oz. of sulphur to the kerosene for each gallon of spray, or use sulphur-lime 1—½—5.

4 BLISTER MITE—
  Plant Attacked—Pear leaf.
  What to Use—Sulphur-lime.
  When to Use—In the spring before the buds burst.

5 GREEN APHIS—
  Plant attacked—Apple, pear, peach, plum, prune, etc.
  What to Use—Sulphur-lime.
  When to Use—In the spring before the buds burst.
  Note—If the insects appear, spray with tobacco into the curling leaves.

6 BUD MOTH, PEACH WORM, OR TWIG BORER—
  Plant Attacked—All orchard trees.
  What to Use—Sulphur-lime.
  When to Use—As the buds are swelling.

Note—Supplement with arsenate of lead when the buds open. Repeat in one week if necessary.

7 WOOLLY APHIS—

Plant Attacked—Apple.

What to Use—Sulphur-lime, kerosene emulsion or tobacco.

When to Use—Just before the buds burst.

Note—Spray with force. Summer treatment—kerosene or tobacco. Root treatment is ineffective.

8 BLACK APHIS—

Plants Attacked—Cherry, peach.

What to Use—Tobacco.

When to Use—When insects appear.

9 LEAF HOPPER—

Plant Attacked—Apple.

What to Use—Tobacco.

When to Use—When insects appear.

10 CODDLING MOTH—

Plant Attacked—Apple, pear.

What to Use—Arsenate of lead.

When to Use—While the last blossoms are falling.

Note—Use a Bordeaux nozzle with a crook and spray with a force from a raised platform directly into every flower. Repeat immediately. If so applied these sprayings are sufficient. Keep a few trees banded If many worms are trapped, spray.

11 SLUG—

Plant Attacked—Pear, cherry.

What to Use—Arsenate of lead.

When to Use—When insects appear.

Note—Or dust with lime, road dust or ashes.

12 TENT CATERPILLAR—

Plant Attacked—All orchard trees.

What to Use—Arsenate of lead.

When to Use—When insects appear.

Note—Burn the tents.

13 CLIMBING CUTWORM—

Plant Attacked—Orchard trees.

What to Use—Poison bait.

When to Use—Scatter when insects appear.

14 TRUNK BORER—

Plant Attacked—Orchard and other trees.

Note—Dig out the worms with the knife. During the growing season whitewash trunk with sulphur-lime containing extra lime.

15 GRASSHOPPER—

Plant Attacked—Garden and orchard plants.

What to Use—Bordeaux.

When to Use—When insects appear.

Note—This is a repellent.

16 FLEA BEETLE—

Plant Attacked—Garden plants.

What to Use—Bordeaux.
When to Use—When insects appear.

17 CUTWORM—
Plant Attacked—Garden plants.
What to Use—Bordeaux.
When to Use—When insects appear.
Note—Place a tar-paper collar on young cabbage plants

18 ROOT MAGGOT—
Plant Attacked—Root crops.
What to Use—Carbolated lime.
When to Use—Apply to soil before maggots appear.
Note—Scatter poison bait before planting.

19 CABBAGE WORMS—
Plant Attacked—Cabbage, cauliflower.
What to Use—Poison bait.
When to Use—Dust the plants before the worms eat in.
Note—No treatment for root maggots is perfect.

20 APHIS—
Plant Attacked—Garden and ornamental plants.
What to Use—Tobacco or kerosene emulsion.
When to Use—Just as soon as insects appear.
Note—Repeat if necessary.

21 MOSS AND LICHENS—
Plant Attacked—Fruit trees.
What to Use—Sulphur-lime.
When to Use—When the leaves are off the trees.

22 LEAF CURL—
Plant Attacked—Peach.
What to Use—Sulphur-lime.
When to Use—Just before the buds open.

23 MILDEW—
What to Use—Sulphur-lime.
Plant Attacked—Peach, apple, grapes, rose, etc.
When to Use—Just before the buds open.

24 BROWN ROT OR FRUIT MOLD—
Plants Attacked—Plum, cherry, peach.
What to Use—Bordeaux.
When to Use—Just before the blossoms open.

25 SCAB—
Plant Attacked—Apple, pear.
What to Use—Sulphur-lime 1—½—5.
When to Use—Just before the blossoms open.
Note—Again while the last blossoms are falling.

26 FIRE BLIGHT—
Plant Attacked—Pear and apple.
Note—Prune out every sign of blight, cutting well below the disease. Dip the knife frequently in carbolic-acid, or corrosive (1—1000).

27 FRUIT SPOT—
Plant Attacked—Apple.
What to Use—Bordeaux.
When to Use—Early in July.

28 BLACKSPOT CANKER—
Plant Attacked—Apple.
What to Use—Bordeaux, double strength.
When to Use—Immediately after the leaves fall.
Note—Again three weeks later.

29 SCAB—
Plant Attacked—Potato.
What to Use—Formalin, 1 lb. to 30 gallons water.
Note—Soak seed for two hours, then cut and plant. Do not plant in soil where scabby potatoes were grown.

30 POTATO BLIGHT—
Plant Attacked—Potato.
What to Use—Bordeaux.
When to Use—July 1st to 15th.
Note—Again two weeks later. If blight is bad on unsprayed potatoes near by, follow with a third application two or three weeks later.

31 WESTERN TOMATO BLIGHT—
Plant Attacked—Tomato.
Note—Spraying will do no good. Set out strong plants, close together, or plant the seed thick in the rows. Give the best of care, shade, and give plenty of water. You will probably lessen the blight.

32 ANTHRACNOSE—
Plant Attacked—Bean.
What to Use—Bordeaux.
When to Use—When plants are all started.
Note—Again three weeks later. Follow with a third spraying three weeks later. Before planting seed reject all diseased ones.

33 SMUT—
Plant Attacked—Wheat and oats.
What to Use—Formalin, 1 lb. to 45 gallons water.
Note—Sprinkle the seed thoroughly; let it lie in a pile two hours; dry and plant with a clean seeder.

FORMULAS FOR SPRAYING SOLUTIONS.

BORDEAUX.

Bluestone	4 pounds
Good lime	6 pounds
Water	50 gallons

Dissolve the bluestone by suspending it in a sack in 25 gallons of water in a barrel. Slake the lime in another vessel, adding a little water slowly, and dilute to 25 gallons. Mix the two thoroughly. Even the best Bordeaux may scorch in rainy weather.

For double strength Bordeaux use twice as much bluestone and lime.

CARBOLATED LIME.

Lime	10 pounds
Water	50 gallons
Carbolic acid	1 pint or more

Slake the lime with a little water, add the rest of the water and the carbolic acid.

SULPHUR LIME.

Sulphur	1 pound
Good lime	1-2 to 1 pound
Water	5 gallons

First slake the lime in the cooking vat. When slaked add the sulphur and about one-fifth of the water, so that the mixture will boil easily. Keep it well stirred. Boil until the sulphur is completely dissolved, which should take less than an hour. Then add the rest of the water, and the mixture is ready to spray. Use only the clear liquid. It should he poured into the spraying tank through a strainer. It may be used hot or cold. There are several ready-made sulphur-lime washes which give good results when properly diluted. When mixed one part to 14 parts of water they usually correspond in strength to the formula above.

Hauling Apples to the Station, Rappahannock County, 200 Barrels per Trip. Distance, 25 Miles.

ARSENATE OF LEAD.

Arsenate of lead	1 to 2 pounds
Water	50 gallons

It is not necessary to use it stronger. Mix well first with a small amount of water.

KEROSENE EMULSION.

Kerosene	2 gallons
Whale oil soap	1-2 pound
Water	1 gallon

Dissolve the soap in the water by boiling, and add the suds boiling hot to the kerosene, away from the fire. The mixture is then agitated violently, preferably by pumping it back on itself with a force-pump. After four or five minutes the mixture suddenly becomes creamy in consistence. If well made, the cream will stand for a long time without free oil rising to the surface. Unless otherwise stated, use 1 gallon of the emulsion to 12 gallons water in spraying. One quart soft soap or 1 pound laundry soap may be used instead of the whale-oil soap.

POISON BAIT.

Paris green	1 part
Bran	40 parts

Mix well. For cutworms make a mash by adding water. Season with a little salt.

TOBACCO.

Tobacco leaves	1 pound
Water	4 gallons

Simmer for one hour and strain. Two pounds of tobacco dust or ground tobacco may be substituted for the leaves. Black leaf extract may be used, 1 part to 65 of water.

A little lysol added to tobacco sprays greatly increases their value, and permits further dilution.—*Experimental Station Bulletin*

GOVERNMENT WHITEWASH.

"Take a half bushel of unslacked lime, slake with boiling water, cover during the process to keep in steam, strain the liquid through a fine sieve or strainer, and add to it a peck of salt, previously dissolved in warm water, three pounds of ground rice boiled to a thin paste and stirred while hot, half a pound of clean glue, previously dissolved by soaking in cold water, and then hanging over a slow fire in a small pot hung in a larger one filled with water. Add five gallons of hot water to the mixture, stir well and let it stand a few days, covered from dirt. It should be applied hot for which purpose it can be kept in a kettle or portable furnace."

A BUSINESS VIRGINIA LADY.

Mrs. M. K. Smith, of Gloucester county, sold last year from one-third of an acre, jonquills for $860.00 net.

Full of Large Apples, Tree Seven Years Old.

WHEN TO PICK FRUIT.

The fruit consumer and the fruit grower are usually too far apart. Too often what is sweet, juicy, luscious fruit in the orchard and vineyard of the grower is on the table of the consumer an over-ripe, pulpy or partially decayed product. It is a lamentable fact that many of our finest fruits are very bad travellers and present, on arrival in town, a very unattractive appearance. Many growers do not know the proper time to pick fruit; that is, the stage of maturity that puts it on the market in good condition. Very often one sees fine, large pears and peaches that are rotting when the packages are opened because the fruit has been allowed to get too ripe on the trees before picking.

Sometimes when the early market is slack there is a demand for immature fruit for cooking purposes. The first early summer apples may be profitably picked when they get big enough for cooking.

This will be while the seeds are still white before the fruit shows much signs of coloring. The market is always looking forward to the earliest apples. Dessert and winter apples should not be picked until well colored. Those that stay on the trees late are better flavored than those picked early. Winter apples will usually keep better if allowed to ripen in the cool weather of the fall, though by this waiting there is danger of heavy wind falls.

Apples should not be separated from the twig by a straight pull but by a twist upwards or sideways. The ease with which some fruits separate from the twig by a nip sideways gives a good idea of maturity.

With some apples two or three pickings are generally made.

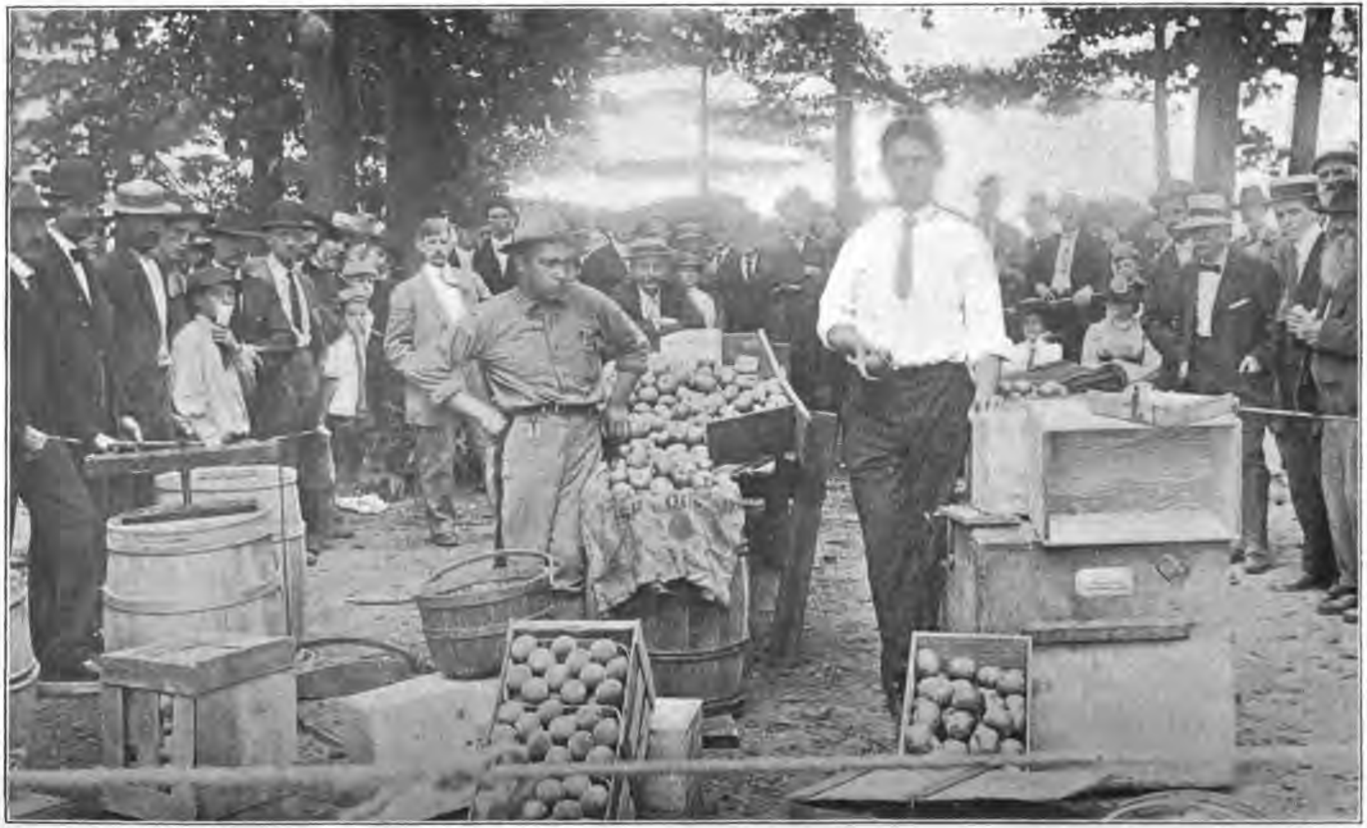
Pears should always be picked from the tree before becoming mellow and be allowed to ripen after storing. The time at which the first full-sized fruits begin to fall is the indication of proper picking time. Peaches are picked for market when they show the clear or bright colors. They should not be pinched to test maturity. The experienced picker has a way of rolling the flat of his hand over the ridge of a peach and the feel means the same to him as grain in the sack does to the miller's thumb.

Plums can be picked greener than any other fruit. With plums, size is about all one needs look for, as the fruit seems to ripen as well off the tree as on it.

Grapes on the other hand should never be picked from the vine till fully ripe and sweet, for they will not develop sugar and ripen after they are picked. I have known unprincipled growers to spoil the market for white grapes by shipping Niagaras before they had become ripe and sweet. Tasting is the sure test with grapes.—*Market Grower's Journal.*

DIFFICULT TO GET A STAND OF CLOVER.

Frequently just 500 pounds of lime per acre will give you a good stand of clover. It will pay you to make this experiment on a few acres, sow the lime a month or so in advance.



One of the Horticultural Society's Grading and Packing Demonstrations.

KING CORN.*

Virginia is fast becoming a great corn growing State. No crop has been more carelessly grown by many farmers. The careless preparation of soil, the cultivation of the crop, and most of all, selection and breeding of the seed. Some of the Virginia farmers are among the best in the United States. What State can show a farmer who makes an average of 100 bushels per acre on 100 acres in one crop? This department has endeavored to help and encourage all our farmers to increase their yield of corn each year. The following bulletin will prove to be helpful to the thoughtful farmer.

SMALL YIELDS DUE TO POOR SEED CORN CAN BE PREVENTED.

The average production of corn to the acre for the entire United States is but twenty-six bushels, yet in practically every section four times that quantity is frequently produced. Improvement of the quality of seed is the least expensive method of increasing the yield per acre.

There is each spring a scarcity of good seed corn. This condition is all the more regrettable because it need not exist, and it is much more serious than commonly supposed because many do not fully realize the tremendous loss to themselves and the country due to planting inferior seed. A full stand of plants may be obtained from inferior seed, but the yield will not be the best possible.

The loss is due to delay or negligence. It can be prevented by the selection of seed corn in the autumn. If good seed corn could be manufactured in a few weeks' time many factories would be working day and night from March till June. Each spring the writer regrets the unfortunate position of many thousands who too late inform the United States Department of Agriculture of their willingness to pay good prices for good seed corn and of their inability to obtain it.

THE VERY BEST SEED IS AVAILABLE AT RIPENING TIME.

Autumn is the time to prepare for a profitable corn crop the following season. It is hoped that this bulletin will prove more valuable and timely than any replies that can be written to springtime correspondents regarding seed corn. Its object is to prevent the scarcity each spring of first-class seed corn. This scarcity can be prevented by selecting the seed when it is most abundant and when the very best can be obtained—at ripening time before it has been in any way reduced in vitality. Many let this opportunity pass, expecting to purchase their seed corn, only to find that they can not buy at any price in the winter or spring as good seed as they could have selected in the autumn.

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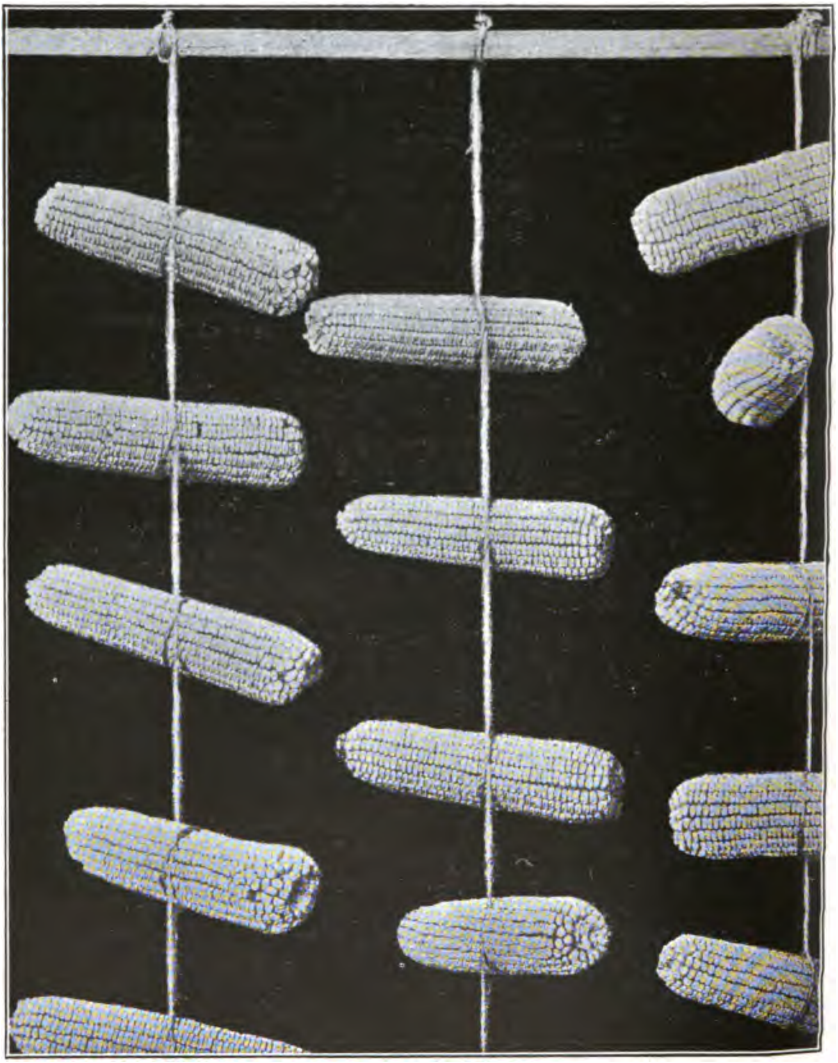
* Copies of any of the following Farmers' Bulletins upon the subject of corn will be sent free of charge upon application to a Senator or Representative in Congress or to the Secretary of Agriculture: 81, Corn Growing in the South; 229, The Production of Good Seed Corn; 253, The Germination of Seed Corn; 272, A Successful Hog and Seed-Corn Farm; 298, Food Value of Corn and Corn Products; 303, Corn-Harvesting Machinery; 313, Harvesting and Storing Corn; 325, Small Farms in the Corn Belt; 400, A More Profitable Corn-Planting Method; 414, Corn Cultivation.

WHERE TO OBTAIN THE BEST POSSIBLE SEED CORN.

Until a community has its experienced and honest corn breeder, the best place for the farmer to obtain seed corn is from fields on his farm or in his neighborhood that were planted with a variety that has generally proved most successful in that locality.



A Good Way to Dry Out Seed Corn.

CORN BREEDING IS A SPECIAL LINE OF WORK.

Well-conducted corn breeding requires special methods that general farmers have not time to apply. If there is in your locality a corn breeder who each year demonstrates the superiority of his corn, you should pay him well for his superior seed. Five dollars a bushel will be a profitable bargain for both parties. Such corn breeders are improving corn as cattle breeders have improved cattle.

The general farmer is a propagator rather than a breeder of corn. He profits by the careful work of the breeder by adopting the higher yielding strains and propagating them.*

WHAT CONSTITUTES GOOD SEED CORN.

By far too many consider seed good simply because it will grow. To be first class, seed must be—

(1) Well adapted to the seasonal and soil conditions where it is to be planted.

(2) Grown on productive plants of a productive variety.

(3) Well matured, and preserved from ripening time till planting time in a manner that will retain its full vigor.

The importance of the three requirements just enumerated has been demonstrated experimentally by the Office of Corn Investigations of the Bureau of Plant Industry. The results given briefly, as enumerated, are as follows:

(1) For a series of five years twelve well-bred varieties were tested in ten Northern States, equivalent lots of seed being used in each State. Varieties that produced most in some States were among the poorest in others.

(2) Seed ears taken from the highest yielding rows of ear-to-row breeding plats have repeatedly produced better than seed ears taken from poorer yielding rows. Seed ears from the best producing stalks found in a general field produced more than seed ears taken without considering the productiveness of the parent stalks.

(3) Four bushels of ears were divided into two equal parts, one part being well taken care of and the other placed in a barn as corn is ordinarily cribbed. The well-preserved seed gave a twelve per cent. increase in production on poor soil and a twenty-seven per cent. increase on fertile soil, notwithstanding the fact that both lots of seed germinated equally well.

HOW TO GATHER SEED CORN.

Make Seed-Corn Gathering a Special Task—At corn-ripening time drop all other business and select an abundance of seed corn. The process is too important to be conducted incidentally while husking. When selecting seed corn give the process your entire attention. Get the very best that is to be had and preserve it well, and your increased yields will return you more profit than any other work you can do on your farm.

The only proper way to select seed corn is from the stalks standing where they grew, as soon as ripe.

Propagate Only From the Best Producing Plants—As soon as the crop ripens go through the field with seed-picking bags and husk the ears from the stalks that have produced the most corn without having any special advantages, such as space, moisture, or fertility. Avoid the large ears on stalks standing singly with an unusual amount of space around them. Preference should be given the plants that have produced most heavily in competition with a full stand of less productive plants.

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* Those especially interested in the improvement of corn by methods of breeding can receive detailed information upon application to the Secretary of Agriculture.

In all localities the inherent tendency of the plant to produce heavily of sound, dry, shelled corn is of most importance.

Late-maturing plants with ears which are heavy because of an excessive amount of sap should be ignored. Sappiness greatly increases the weight and is likely to destroy the quality.

In the Central and Southern States, all other things being equal, short, thick stalks are preferable. Short stalks are not so easily blown down and permit thicker planting. Thick stalks are not so easily broken down and in general are more productive than slender ones.

The tendency for corn to produce suckers is hereditary. Other things being equal, seed should be taken from stalks that have no suckers.

TREATMENT OF SEED IMMEDIATELY AFTER GATHERING.

The same day seed corn is gathered the husked ears should be put in a dry place where there is free circulation of air, and placed in such a manner that the ears do not touch each other. This is the only safe procedure. The writer has repeatedly seen good seed ruined because it was thought to be already dry enough when gathered and that the precaution mentioned above was unnecessary. Many farmers believe that their autumns are so dry that such care is superfluous. Seed corn in every locality gathered at ripening time will be benefited by drying as suggested. If left in the husk long after ripening it may sprout or mildew during warm, wet weather or become infested with weevils.

The vitality of seed is often reduced by leaving it in a sack or in a pile for even a day after gathering. During warm weather, with some moisture in the cobs and kernels, the ears heat or mildew in a remarkably short time.

The best possible treatment immediately after gathering is shown in figure two. Binder twine will support fifteen or twenty ears on a string, arranged in the manner illustrated. Ordinarily the best place to hang these strings of ears is in an open shed or loft.

Permanent seed racks are more convenient than the use of binder twine, and when they are located in a dry, breezy place the ears dry sucessfully.

DESTROYING WEEVILS OR GRAIN MOTHS.

If at any time signs of weevils or grain moths show on the corn, it should be inclosed with carbon bisulphide* in practically air-tight rooms, bins, boxes, or barrels for forty-eight hours. The bisulphide should be placed in shallow dishes or pans on top of the seed. One-half pint is sufficient for a box or barrel holding ten bushels or less. One pound, costing about thirty cents, is sufficient for a room or bin ten feet each way. After fumigation the ears must be thoroughly aired, taking care that no fire is present when the fumigating box is opened.

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* See "Carbon Bisulphid as an Insecticide," Farmers' Bulletin 145, U. S. Dept. of Agriculture.

WINTER STORAGE OF SEED CORN.

After hanging in the shed or lying on the racks for two months, the seed ears should be "dry as a bone" and contain less than ten per cent. of moisture. They can remain where they dried or be stored in mouse-proof barrels or boxes during the winter, but in either case must not be exposed to a damp atmosphere or they will absorb moisture and be injured. Some farmers place the thoroughly dried seed ears in the center of a wheat bin and fill the bin with loose, dry wheat.

This Ear of Corn took the $1,000 Premium at National Corn Show.

Preventing Injury from Weevils and Grain Moths—In localities where weevils an grain moths injure stored grain, the thoroughly dry seed ears should be stored in very tight mouse-proof receptacles, with one pound of moth balls or naphthalene inclosed for each bushel of corn. This quantity tightly inclosed with the corn will prevent damage from these insects and will not injure the seed. The material will cost about three cents a pound. Thirty cents' worth will protect seed enough to plant sixty acres.

TESTING THE GERMINATION OF SEED CORN.

Seed corn that matured normally and has been properly preserved will grow satisfactorily. It is very poor management to neglect proper preservation and to spend time in the spring separating by germinating tests those ears that have been badly damaged from those that have been slightly damaged. Prevention is better than cure, and in this case a cure is impossible.

Ears slightly damaged by poor preservation may germinate well, but will produce less than if they had received better care.

Make a seed-corn testing box* and test 100 ears separately. Be sure that each kernel tested is perfect in appearance and was not injured at the tip when removed from the ear. If three or more kernels out of ten from any ear fail to grow, it will be advisable to test every ear in the entire supply of seed corn. If the 100 ears tested contain no poor ones, further testing of the supply is unnecessary.

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* **See Farmers' Bulletin 253, U. S. Dept. of Agriculture.**

All of these crops were grown on one farm by one of Virginia's best farmers, Mr. James Bellwood.

GRADING SEED CORN.

Shelled corn is difficult to grade satisfactorily. The grading can be done better before the ears are shelled. If the seed ears vary greatly as to size of kernel they should be separated into two or three grades according to size of kernel. These grades should be shelled separately, tested in the corn planter, and numbered to correspond with the number on the planter plates that are found to drop them most uniformly. These arrangements can be completed before the rush of spring work begins.

METHOD OF SHELLING.

Seed Ears Should First be Nubbed—The first operation in properly shelling seed corn is the removal of the small kernels from the tips of the ears and the round thick kernels from the butts. The former are less productive than the other kernels of the ear. The round butt kernels are as productive as the other kernels of the ear, but do not plant uniformly in a planter.

One Hundred and Eighteen bushels to the Acre.

Grown by C. H. Agee, Buckingham County. This farm ten years ago was one of the poorest in the county. Good farming did it.

Hand Shelling is the Best Method—Shelling seed corn carefully by hand is profitable. The greater the acreage planted the greater the profit. Into a shallow pan or box each ear should be shelled separately, rejecting any worm-eaten or blemished kernels. If the supply from the one ear appears good and contains no poor kernels, it is poured into the general supply and another ear shelled in the same way.

SUMMARY.

If you have ever found yourself compelled to plant corn that was not fit for seed, do not be caught that way again. It is too discouraging to begin the season with poor prospects of a good crop. Get your seed at ripening time when the best quality is most plentiful. Get an abundance, enough for planting again what the high water may destroy and a supply for some farmer who may move into your community or for a neighbor who could not select his seed corn at the proper time.

Save seed only from the most profitable individuals with the same care you use in propagating your animals.

Care for each living kernel from the time it ripens until it is planted in a manner that will enable it to develop into a thrifty plant and produce one or more large ears. Do not expect germination tests made in the spring to restore vigor that proper gathering, drying, and storing would have retained.

Shell your seed carefully by hand.—*U. S. Bulletin 415.*

While you are improving your seed corn in the above way, begin a seed breeding lot where you can breed up your seed corn to the highest improvement as described in the annual report for 1909.

G. W. KOINER.

HOW MR. BELLWOOD GREW 160 BUSHELS OF CORN PER ACRE.

Mr. Bellwood Grew One Hundred Bushels Per Acre On One Hundred Acres.

R. F. D. No. 1., MANCHESTER, VA., *October 20, 1910.*

HON. GEO. W. KOINER,
Richmond, Va.:

DEAR SIR:

My father handed me your letter of the 14th inst., asking about how my son grew 160 bushels of corn on one acre.

The land is James river low ground, though not wet land. The field had for the three years previous been in timothy, red-top and clover. During February of this year fourteen good two horse loads of stable manure were spread on one acre; the land was then plowed and subsoiled to a depth of sixteen inches.

May 6—plowed again ten to twelve inches deep and well harrowed. May 19—cut up with disc harrow, rolled firm and planted with Virginia White Dent corn.

As soon as the corn was large enough it was cultivated. The surface was kept loose by frequent level cultivation until the corn was about four feet high, when a light furrow was thrown to rows. This plowing damaged some of the corn roots, but on rich low grounds weeds and vines if allowed to grow would greatly reduce the yield and the use of the little plow offers the cheapest and most effective way of overcoming them. After this an Iron Age single cultivator, set wide, was run through as often as necessary to keep the surface from becoming hard.

We have been husking to-day in another field of high land which is yielding 132 bushels per acre.

With the usual method of handling this land, viz.: four to five loads of manure, two plowings about eight inches deep, one in the fall, the other in the spring; twice over the land with smoothing harrow before planting and three times with cultivator after—the yield would probably not have been over sixty bushels. With the heavy application of manure and winter plowing eight inches deep and sub-soiling ten inches more, later plowing twelve inches deep, thorough fining of the surface with disc harrow and roller before planting, the use of seed every ear of which when previously tested showed strong germination, shallow cultivation after planting to the point of bringing about and maintaining a dust mulch, the difference in yield was seventy-two bushels.

Yours truly,
A. R. BELLWOOD.

WINTERING THE WEANLING COLT.

The selling value of the three-year-old, or its working value if kept on the farm, will depend very much on the way it is wintered as a weanling. For a colt once stunted by bad management during the first winter never recovers fully.

There are three ways of handling the weanling. One is to wean it suddenly, turn it in with the yearlings or two-year-olds, and let it take pot luck, getting what fodder and corn it can get out of the cornfield, what pasture it may find during the winter, and taking its chances on the right side of a hay or straw stack when there is a cold rain or when a blizzard is raging. The colt treated in this way will not fill out its measure, It will be worth anywhere from twenty-five to fifty dollars less than it would be worth if properly treated.

Another way is to tie it up in the stable, feed it all the corn and timothy hay it wants during the winter. In this case it will come out fat in the spring, but with poor muscular development from lack of muscle-making feed and also from lack of exercise.. This will give you a nice-looking colt in the spring; but it is not the way to winter the colt.

The third way, and the only way to follow, is to wean it gradually. If it has been properly managed as a suckling, this will be an easy matter. Every colt, long before weaning, in fact from the time it is two or three weeks old, should be taught to eat a little grain, and still more grain as it grows older. It should be weaned gradually, and thus be enabled to take up an independent existence without any shock to the system Its feed should be of a muscle-making character. There is no animal on the farm that will pay a higher price for good, sweet oats than the well-bred colt. It should have corn in cold weather. A ration of half oats and half corn will not be out of the way any time. Then it should have clover hay.

It should not be shut up in the barn, nor should it be left to fight its way with the larger horses. Where there are two or three colts together, they can be handled more easily than where there is but one. It should have all the exercise it wants. The colt does not need shelter except in storms. Give it a chance for shelter, and let it do as it pleases.

Handled in this way, the colt can be wintered quite as cheaply as the steer. It will stand more roughing it than the steer. It will keep itself warm by exercise. It will grow a coat that will furnish it much winter protection. It will be normally developed, not excessively fat, but muscular, the muscles developed by the free play and exercise. It is just as cheap to handle a colt this way as it is to put it in the barn. It costs more than it does to let it shift for itself; but in the latter case you have a dwarfed animal, and in the former you have a well-developed colt. You have safely passed the critical period, and with any kind of decent care you may expect a fully developed animal.

TRUCKING IN VIRGINIA.

Virginia is the birthplace of trucking in America. Her kind soil and salubrious climate, and her geographical location are not equaled by any other State. These trucking lands are sure to increase in value very largely for years to come.

The Norfolk truckers were the first to organize and manage their business collectively. The purchase of their fertilizers, empty packages, freight rates, commissions, and careful handling of their freight, show the great power that organization secures to the farmers. The Norfolk truckers shipped this year 4,555,200 packages of trucks. Three farmers grew this year 75,000 barrels of potatoes.

The truckers on that garden spot, the EASTERN SHORE, have shown as much business enterprise in their splendid organization, where the great success in their trucking has increased their lands from twenty-five to more than 100 dollars per acre in average value. This fine organization shipped this year from May 1st to November 15th, 1910, 1,050,000 barrels white potatoes, 800,000 barrels sweet potatoes, 63,000 barrels and crates onions, 58,000 crates strawberries, 41,000 crates cabbages, and 8,500 packages peas, turnips and other vegetables. The splendid success these truck farmers have achieved, has been a valuable object-lesson to all the farmers of the State as to the value of organization. The fruit growers have caught the spirit, and so have the peanut growers and the tobacco growers. May this movement continue to grow until every farmer in the State enjoys the protection and benefits that organization and co-operation secures.

FERTILIZER BULLETINS.

Farmers who are not receiving the fertilizer bulletins quarterly will please send their names to the Commissioner to be put on the mailing list.

THE APPLE ORCHARD—HOW TO PLANT.

Apple growing in Virginia has increased wonderfully during the past ten years. When properly managed, it is one of the most profitable investments that can be made. The soil, the climate, and the market facilities in this State cannot be equalled anywhere else. The trees bear to the age of 100 years or more. The trees grow in value for fifty years. Many farmers in this State this year sold their crops for $5,000.00 and $10,000.00; some for $20,000.00 and up to $35,000.00. Some orchards yielded crops that sold for $500.00 per acre as the apples hung on the trees. Many letters are received asking how to set out an orchard. This bulletin gives that information.

LOCATING AN ORCHARD.

The selection of an orchard site is not governed by any arbitrary rule. All farms do not afford the best soils and exposures for orchards. The owners of such as do not are unfortunate, yet they should not feel discouraged to the extent of not planting trees and caring for them afterwards.

EXPOSURE.

Some kinds of soils and surface presentations are preferable to others, as they are better adapted to this fruit and require less expense in preparation and in the after care and treatment of the orchard. The most intelligent and experienced orchardists often differ as to the best location and exposure of an orchard, some preferring a northern slope, others an eastern, and yet others recommend a southern or even a western as best. We think, however, that the advantages preponderate in favor of a gentle eastern or northeastern slope, as orchards located on such sites suffer less in both soil and tree from the effects of heat and drought. An orchard with such an exposure will maintain its vigor and longevity better than if inclined to the west or southwest. Thus the planter will often be forced to forego such a location and take his chances where the natural conditions are not so favorable. If possible, the site should be elevated above its immediate surroundings, thus giving a free circulation of air; and it will also be of great aid in guarding against late spring frosts, so fatal to young fruit at the blooming season.

SOILS.

Apple trees will thrive and do well on almost any soil well prepared, but the different kinds of soil may require different treatment and after care.

Loamy Soil.—A loamy soil is naturally rich in plant food, hence will need little, if any, manuring in its preparation. But it should be deeply stirred and thoroughly broken up by subsoiling. This loamy soil is what may be termed free soil, as it seldom becomes compacted, even by abusive treatment.

Clay Soil.—A clay soil is the most difficult to prepare, and often requires manuring as well as thorough plowing, replowing and sub-

Mr. James Craig's Apple Orchard in full bloom. This orchard produced the largest crop in the State this year.

soiling. It should be also frequently stirred during the summer months, and especially as soon after each rainfall as is practical, to prevent it from baking and becoming compacted. This becomes even more important in seasons of long and continued droughts.

Sandy Soil.—Sandy soils are generally lacking in necessary plant food. They also have the objection of losing such fertilizers as may be added by the leaching of the rainfall.

Effects of Several Soils.—The wood growth on loamy soils will be strong and vigorous, but may not be sufficiently mature to withstand the freezing of the more rigorous winters. Clay lands are not so apt to produce such vigorous growth, and orchard trees on such lands will be hardier as to winter-killing than are most other soils. With a free subsoil underlying it, a loamy clay soil will probably yield the best results, especially if it be well prepared by thorough culture and sub-soiling before planting the trees. Timber lands or lands on which forests have formerly grown, if having the proper exposure and drainage, are preferable for orchard sites. Such lands contain all the elements of plant food necessary to insure a good and sufficient wood growth and fruitfulness. Fruit grown on such lands will rank first class in size, quantity and appearance.

DRAINAGE.

All orchard lands should be thoroughly surface drained and subdrained. No orchard can endure for a great length of time with stagnant water either on the surface or within the soil. All surplus water from excessive rainfall or from other causes should be promptly removed by either surface or sub-drainage.

If the natural formation of the land does not afford such prompt drainage it must be provided artificially. Surface ditches or furrows between the rows of trees may afford temporary drainage, but they are objectionable on other accounts that will be apparent; for an orchard thus drained will be bad to get over in its necessary care and in gathering and handling the fruit. Sub-drainage is far better on these accounts; besides, it is much more thorough, especially if supplied with well laid tile.

A thorough breaking up of the subsoil will afford temporary drainage in a stiff clay soil, but in a few years the soil will again become compacted, when it will require re-stirring. But in all cases the planter should be the judge of the special requirements of his soil and location as to drainage, etc.

USE OF FERTILIZERS AND OF CLOVER.

The soil constituting the proposed orchard site should be carefully studied and if found to be lacking in essential elements of fertility naturally to maintain a fairly vigorous wood growth, fertilizers should be added before plowing, that they may become thoroughly incorporated with the soil in preparing the land for planting.

BARNYARD MANURE AND WOOD ASHES.

Scientists and practical orchardists are generally agreed on the great value of well rotted barnyard manure as the best for an apple orchard.

A Large Field of Crimson Clover, the Greatest Soil Improver.

It not only supplies humus, but it contains a large per cent. of other necessary nutritive elements for maintaining health, vigor and fruitfulness of tree and development of qualities for a fine fruit product. But as the stock of this sort of manure is not always sufficient for the general demand, other agents have to be resorted to; and next in value and in a concentrated form are unleached wood ashes, which will supply to a great extent the necessary element of plant growth. It is maintained by some authorities that one ton of unleached wood ashes contains as much plant nutriment as five tons of ordinary barn manure, and whenever obtainable ashes should be used in preference to any other fertilizer.

MANUFACTURED FERTILIZERS.

There are many kinds of manufactured fertilizers, some of which are valuable for special soils, but to determine just which brand to use is a difficult question to decide without knowing what elements are lacking in the soil. The three elements most commonly deficient in soil are nitrogen, potash and phosphoric acid, and chemical fertilizers that contain the largest per cent. of these substances will be the most economical and beneficial.

A fertilizer containing one and one-half to two per cent. of nitrogen, seven to nine per cent. of available phosphoric acid, ten to twelve per cent. of potash, will give excellent results when applied to orchard land in quantity ranging from 400 to 600 pounds per acre.

GROWING OF CLOVERS.

Where lands are generally sufficiently fertile for an orchard growth, and need no enriching until the trees begin to show signs of weakness in vigor from crop bearing, and even then may be invigorated by use of crops of red or crimson clover or cowpeas grown among the trees, allowing the crop to fall and decay upon the ground each year. By this treatment a large amount of decaying vegetable matter will accumulate upon the land, rich in plant food and forming a moist protection from hot summer sun and deep freezing during winter, a condition conducive to health and vigor in tree. All lands lacking in humus can have this element restored to a great extent by such treatment, and orchards which have been treated thus with clover maintain greater longevity, fruitfulness, and greater excellence in fruit product, besides such treatment dispenses with the costly necessity of using special fertilizers.

SIGN OF NEED OF MANURE AND CULTIVATION.

As to the indications when a bearing orchard needs stimulating, the eminent pomologist, Dr. Warder, once said: "When the growth of the terminal branches fails to make an annual extension of at least one foot in length, the tree should be stimulated by manuring the land and giving it thorough cultivation."

PREPARING THE LAND FOR PLANTING.

The general work of preparing the land for planting an orchard consists in deep tilth, and the more thoroughly it is done the more certain is success. The preparation had best be done late in the fall, when it will be ready for early spring planting or for fall planting, if preferred. Many successful orchardists prepare the land by opening with a heavy plow a furrow where the rows of trees are to be set and then back furrowing the space between them, making a land section with a tree row in the center.

This method affords a deeper tilth under the trees, and at the same time surface drainage into the opening and finishing furrow midway between the rows, which will receive and, if properly graded, carry off any surplus water which may accumulate from heavy rainfalls.

DISTANCES FOR PLANTING.

A decision as to the proper distance apart to set trees varies with different plantings. Some plant sixteen by thirty-two feet; that is, the rows one way are thirty-two feet apart. The object of this method is to obtain a crop from the trees until they begin to interfere with each other, when every alternate tree in the row is cut out, leaving the trees in the entire orchard at a distance of thirty-two feet each way. The trees to be cut out should be early-bearing, short-lived varieties. This system has the advantage of utilizing the land between the rows, which becomes a source of great fruit product before the thinning out becomes necessary.

But it is generally conceded that thirty-two to forty feet is the preferred standard distance. If the distance of forty feet each way is adopted, it will afford ample space between the rows for growing any crop which requires cultivation, such as beans, potatoes, etc. Such cultivation is highly important and necessary for the maintenance of moisture in the soil and to the health and vigor of the trees. This distance will afford free circulation of air and abundance of sunlight, both of which are essential to the growing of well-developed and highly-colored fruit. As stated elsewhere, *small grain should never* be grown among fruit trees, especially when the orchard is young.

SEASON FOR PLANTING.

This question is governed somewhat by latitudes. In southern latitudes late fall or the early part of the winter may be safe for planting. But in most of the States early spring is considered the better time. Fall planting has the objection against it that the roots of a tree do not take hold of the ground sufficiently to supply enough moisture to maintain a healthy active circulation of the sap which is required to prevent shriveling of the branches during winter's extreme cold and exhaustive evaporation from drying winds.

SELECTION OF TREES.

This is a very important part of orcharding, for upon care and judgment in the selection of trees depend largely future profits of the investment. Strong, stocky and vigorous one- or two-year-old trees, called whips by nurserymen, having well-developed root systems, are preferable. Trees of this type and age are more satisfactory and profitable in time and suffer less in transplanting, cost less and are much more easily handled than older ones.

In this connection we would suggest the advisability of purchasing trees for planting from the nearest responsible nurseryman. The local nurseryman, if perfectly familiar with his business, will understand the needs and demands of his home customers and should grow the varieties best suited to his section of country. If honest, he should feel himself morally, if not legally, responsible for the correctness of his nomenclature.

CHOICE OF VARIETIES.

A comparatively safe guide for the planter to follow or to be governed by is to study well his immediate environs and to take counsel of those of his neighbors who have had practical experience in growing varieties on soils and exposures quite similar to his own. In this way he may be able to obtain valuable information in regard to varieties that have been tested and found to succeed in his neighborhood.

Present Demand as Affecting Choice of Varieties.—In the pioneer days of fruit culture the great aim and object of the enterprising planter seems to have been to secure and plant all of the numerous varieties within his reach without considering the question of adaptability of the variety to the conditions of soil and climate. For a time at least, while the soil was new and diseases and insects less numerous, his efforts gave fairly satisfactory results. Now, however, conditions have changed and many of the sorts that were once popular and profitable are considered valueless. So that, notwithstanding the list of desirable varieties is greatly increased, growers find themselves compelled to study more carefully the adaptability of the varieties suited to their special conditions and purposes.

The State Horticultural Society has prepared and published a list of varieties recommended for the different sections of Virginia.

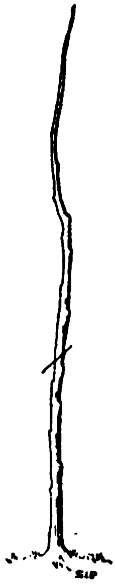
Need of Succession as Affecting Selection.—In making up a list of varieties for a family orchard, it is highly important to select such as will ripen in succession, so as to furnish the family with fruit throughout the entire year. This can be readily done by planting the early-ripening sorts, followed by late summer, fall and long-keeping winter varieties.

PLANTING.

The land having been prepared by plowing, and manured when needed, the lines to guide the planter may be marked off with a plow run deeply, opening a furrow in the direction that will afford drainage, into which the trees may be set without digging holes, especially if in clay land, which would form basins that would retain water too long after a heavy rainfall.

DETAILS OF SETTING THE YOUNG TREES.

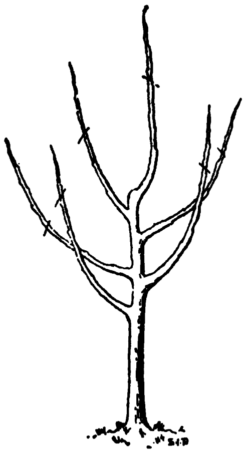
The work of planting is made comparatively easy by the method recommended in the foregoing, viz: by the opening of a furrow with a plow for the rows and cross-checking to indicate the point at which to set the trees. When planting, cut back the top to a point where the future head is to be formed, smooth off the ends of all bruised and broken roots, then set, at the point in the row indicated by the cross-check, straighten the roots out into a natural position and fill in among them firmly fine dirt and tramp all down with the foot. It is best to set the tree a little deeper than when in the nursery, and leaning slightly to the south or southwest, to brace them against prevailing winds. By this position the tops will soon shade and protect the bodies from the intense heat of the summer sun, which is liable to cause sun scald. After the planting of the orchard is completed the open furrows between the trees may be filled up by plowing one or more furrows against the row. The second year the young shoots must usually be cut back again.



One-year-old Tree with Line to Show where to Cut Back.

LOSSES BY LACK OF CARE.

In connection with this subject it is desired to lay special stress upon the importance of performing all operations of the management and care of an orchard in a painstaking way. It is worse than time and money squandered to purchase trees, transplant them and then neglect them afterwards in such a manner as to lose them entirely, and yet this is the result in a very large majority of cases. It has been estimated that scarcely more than ten per cent. of the trees that are grown and sold by nurserymen survive the after ordeal to which they are subjected before reaching the bearing age. And this great loss is very largely the result of carelessness and neglect of the planters. The farmer who does not propose to give the same careful treatment to his orchard that he does to his other crops had better not make the effort to have one. If he expects to sow his young trees to grass or small grain and then to graze it with calves or other live stock he will find other and cheaper methods of occupying his land and feeding his stock than by investing in trees. Better save his money and pains and wisely decide in advance to go without an orchard.



Two-year-old Tree with Lines to Show where to Cut Back.

CULTURE.

Thorough and oft-repeated stirring of the soil is absolutely essential to success. Such culture as is needed to produce a first-class crop of corn or potatoes will keep an orchard in good health and vigor, provided the ground is sufficiently fertile. As already stated, in no case should small grain or grass be grown in an orchard. This mistake is often made by thoughtless or inexperienced planters.

The ground having been properly prepared before planting, a two-horse cultivator frequently run between the rows will keep it in good condition during growing season. Each spring the surface should be well stirred with a two-horse plow, using a short singletree next to the row of trees to avoid danger of bruising the trunks of the trees. In plowing, the furrows should be alternately turned toward and from the trees. Such culture should be continued from year to year at least until trees come into full fruiting, and even then it is questionable whether it should be discontinued. If it should be, red or crimson clover is the only crop allowable, and that should turned under as often as once in every two years. As a rule, continuous cultivation gives the most satisfactory results.

PRUNING AND TRAINING.

Pruning and training are requisites in the successful management of an apple orchard. The objects to be attained are: First, symmetrical and evenly balanced heads; second, to admit sunlight and free circulation of air into all parts of the tree top and yet maintain sufficient density of foliage to protect the trunks, branches and fruit from the direct, intense heat of the sun's rays, which is liable to scald and injure both tree and fruit.

Training should begin in the nursery row by removing or preventing all unnecessary growth, which may be done by rubbing off the buds or pinching back with thumb nail the tender shoots with a view to form a straight, clean leader from the ground up, from which to form the future trunk.

SHAPING THE TREE.

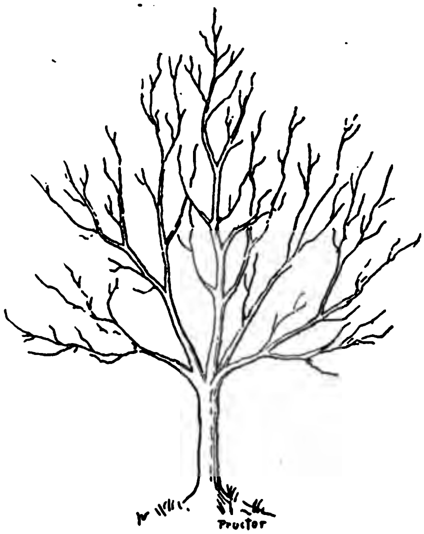
As recommended under the head of planting, this single stem, if it has attained a sufficient growth, should be cut back at the age of one or two years to the height from the ground it is proposed to form the head of the tree when set in the orchard. This cutting back will cause several of the upper buds to break and grow, thus starting the top or head at proper height; and these should be watched, and only such left to grow as are to form the main branches. Those left should be the strongest shoots, at equal distances apart around the stem, and should tend to an outward growth—to spread and make an open head.

In all pruning to give the desired form to the head, and especially while the tree is young, the orchardist should keep clearly fixed in his mind the future form of tree—that is, what it should be when old; for what may seem an open head when young may prove, when the trees are older, to be too dense and crowded, the branches too closely formed together for convenience in getting around it in gathering the fruit or in giving necessary pruning.

During early springtime, or even late winter for convenience, when the wood is not frozen each year, every tree should be carefully looked over, and all branches which are liable to interfere with adjoining ones should be cut out and the centers of the dense growth thinned out; side branches which are making a stronger growth than the others should be checked by heading in the terminal or central shoots, and all parts of

A Young Orchard with 95 per cent. of Number One Apples.

the tree should be cut back whenever needed to maintain an evenly balanced head. Some varieties have an upright habit of growth and some make slender growth; such need close attention each year in cutting back one-half of last year's wood growth, leaving the top bud on the side of the branch facing the direction to which it is intended to divert the growth. By this treatment there will be no difficulty in shaping the tree into any desired form. Open spaces in the tree may be closed up; as, for instance, when the tree has been deprived of a necessary branch by accident of otherwise, the loss may be recovered in time by pruning the adjoining branches so as to divert the growth into the portion made bare of branches.



Intermediate Form of Tree; Proper Shape.

All pruning and training possible should be done while the trees are young, the growth of wood tender, as the healing over is more rapid and complete and the tree suffers less injury by the operation. If ever it becomes necessary to remove a large branch, the wound should be covered with grafting wax, paint, or some other substance that will prevent evaporation and the wood from checking and consequent decay.

Height of Top.—There is a diversity of opinion among orchardists as to the proper height at which to form the top or head of an apple tree. Formerly from four to five feet high was the common practice of training apple trees, but two to three feet is now conceded to be preferable. Eighteen inches is preferred by some.

The objection to low-headed trees on account of the difficulty in cultivating the land has been overcome by practical experience. A careful teamster will do less damage to a low-headed tree than to one with high top. With the improved implements now in use thorough tillage can be performed as well among low-headed trees as with higher. There is less danger from high winds with the low heads, and pruning can be performed with greater facility and ease, and the saving in expense of gathering the fruit is quite an item; but the more important advantage gained by the low head is the protection of the body of the tree from the rays of the sun, causing what is known as sun scald, which is very prevalent in some sections of the apple-growing region.

Another point gained by the low head is in conservation of moisture and lower temperature around the base of the tree.

No arbitrary rule, however, should be laid down as to the height of a fruit tree. This may depend upon the locality, exposure, variety and the desire of the planter.

A young York Imperial Tree just full of Apples, as it ought to be.

Some varieties have an upright habit of growth, while others have a drooping or horizontal habit, each requiring a training according to its requirements; but whatever difference of opinion there may be on this subject, it is now generally conceded that the low top, all things considered, is preferable.

Form of Top.—There are three forms that are generally adopted in this country. One known as the vase or goblet form. This form prevails to a large extent in the Pacific coast region, where by long experience it has been found to be best suited to the conditions of that section. This form is obtained by cutting out the central stock or leader and training by a system of pruning.

The pyramidal form is the opposite of the vase form in that the main stock or leading shoot of the tree is allowed to maintain its upright growth and the side branches are shortened back so as to produce the form of a pyramid. There is, however, a modified form between the vase and the pyramid which gives a round, symmetrical shape to the tree sufficiently open to allow of free circulation of air and sunlight. This form is more generally adopted and gives better satisfaction throughout the central and eastern apple-growing regions.

PROTECTION FROM MICE AND RABBITS.

These animals, wherever they exist, are liable to do much damage to young trees during the winter months, especially whenever the ground is covered with snow. Anything that affords protection to mice, such as grass, weeds or leaves, should be removed from around the trunks of trees.

It is only when the natural food of the rabbit is cut off by being covered with snow that this destructive little animal is forced to resort to gnawing the bark from fruit trees. To prevent this pest from doing this damage, many methods have been devised. but the most effective plan is to tie some material around the body of the tree to the height of two feet or more. Cornstalks cut to the desired length are the most available material for the farmer to use, and serve the purpose very well. Building paper, plain or tarred, is effective, and even old newspapers tied around the trees have been found to serve the purpose just as well. Every farmer should see to it that some such protection is given his young orchard before winter sets in, else he may find too late that his trees have been girdled and ruined by these mischievous animals.

SUMMARY.

1. A gentle eastern or northeastern slope, as a rule, is the most desirable for an orchard site, but this may vary in different apple sections.

2. Soils such as are found in timber regions afford the best results, but outside of such districts clayey loam having free surface and subsoil drainage are best.

3. Well-rotted barnyard manure is the most valuable for apple orchards. The next best fertilizer is crops of red clover grown among trees and allowed to fall and rot on the ground or frequently turned under and re-seeded.

4. Thorough surface tilth is required to obtain best results in the orchard, and when needing fertility the land should be properly manured before plowing.

5. Trees are more safely set in early spring. They should be strong, vigorous, one or two years old, having a well-developed root system, and at time of setting their tops should be cut back to the height at which the main branches for the future top is to be formed. All broken and mutilated roots should be cut back to sound wood. For easy planting open out a deep furrow with a two-horse plow along the line where the rows are to be made and cross check at the distance apart at which the trees are to stand. At the crosses level off the ground at the bottom of the furrow to receive the tree with its roots in natural position and fill in the dirt among them well and tramp down, leaning the tree slightly to the southwest.

6. Thorough tillage with a cultivator during the growing season is recommended, and plowing the land each spring, turning it each alternate year toward the trees.

7. Prune each year in early spring before growth starts, removing all cross branches, and thinning out where too densely grown, so as to balance the tops and afford free air circulation and admit sunlight to all parts of the tree.

8. All classes, summer, autumn and winter apples, must be carefully picked without loosening the stems from the fruit; handled carefully to avoid bruises or breakage of skin, and placed under protection from sun and wind until final disposition is made of them. Apples for home use should be stored in some place where the temperature should be kept as low as possible without danger of frost.

9. Summer and autumn sorts, if for market, require an immediate disposition, as they are quickly perishable. Winter varieties may be held for a while during a glut in the market and in seasons of a shortage generally. At other times it is a question of good business policy for the producer to consider well the best way of disposing of his crop.—*United States Bulletin 113.*

HOW TO REMOVE PLANTAIN FROM CLOVER SEED.

The narrow-leaved plantain or buck horn is one of the worst seeds to sow on the farm, it comes frequently in the clover seed. Dont buy any seed that contains it. If it is in your own seed, try to get it out. The Department of Agriculture has suggested a way to separating the seed that it thoroughly practical, namely, to moisten it thoroughly with water and stir into it road dust, ashes, or sawdust, or anything that will stick to it. The plantain seed is mucilaginous, the clover seed is not. The dust, ashes, or sawdust will then stick to the plantain seed, making it larger, until it has time to dry, and it can then be sieved out. This is worth trying, and the more so because it is the only way we have ever heard of for separating the seeds of plantain from clover.

GRAPE-GROWING IN THE SOUTH.

Grapevines grow well in nearly all parts of the South, and with reasonable care they seldom fail to produce abundant crops. The grape may, therefore, be set down as among the most satisfactory fruits grown in this section. Grapes ripen at a season when other fruits are scarce; their acid flavor is specially agreeable in the warm days of August, and they can usually be sold at a fair price. In the South the vines are never injured by severe freezes, and therefore need no winter protection. Occasionally a late spring frost destroys the early blooms, but never hurts the vine enough to prevent its bearing a fair crop of fruit. Few fruit-bearing plants are less particular about the soil in which they grow, and few will yield so much fruit in proportion to the land they occupy and the labor they require. Wild grapes are abundant in the woods throughout the entire region, and wherever grapes are found growing wild the cultivated vines are sure to succeed. There is no part of the South where grapes of fine quality can not be grown in sufficient quantity for home use, and in many parts they are an exceedingly profitable market crop.

Although grapes will grow luxuriantly and bear heavy crops with very little attention, still they do need some intelligent care, and without it they are sure to prove disappointing. The actual work of caring for the vines is not great, and the methods which should be followed are simple and easily learned. The development of new varieties has made the production of good fruit much more sure than formerly; the introduction of improved forms of trellis has made pruning a very simple operation; and successful methods of preventing loss from insects and fungi are now so well known that grapes should have a prominent place in every garden. In the following pages are given the methods which southern growers have found most satisfactory, knowledge of which, it is hoped, may prove useful to those who wish to grow grapes in a small way for family use, or more largely for market for or wine making.

LOCATION AND SOIL.

The Vineyard Site.—When grapes are to be grown extensively the location for the vineyard should be chosen with care; but when only a supply for home is use wanted, the vines will naturally be planted in some convenient place near the house, and additional labor will be made to compensate for any deficiencies in the soil. Other things being equal, a gentle slope to the south and east is to be preferred for a vineyard because it favors earlier growth in the spring and earlier maturing of the fruit. If practicable, the vineyard should be arranged with the rows of vines running north and south, so that the tops of the vines will shade and protect the main stems and roots from burn and sun scald. The slope of the ground should not be so steep as to cause washing, but should be sufficient to carry off surplus rainfall promptly. Steep hillsides are often recommended as good vineyard sites, and in some parts of the country they are desirable locations; but, with the rainfall as heavy as it is in most parts of the South, such locations require too much labor in terracing and in repairing damages from heavy rains to be profitable. Perfectly flat lands are equally objectionable, because where the soil does not have quick and thorough drainage the vines make an unhealthy growth, and the fruit is poor in quality. When the fruit is to be grown for market the vineyard should be very near the shipping depot, as the expense and delay of hauling even a short distance are items of considerable importance.

The Question of Soils.—Grapes will grow on any soil which is suited to the growing of peaches. The best soil is one which is fertile, but not excessively rich; which is loose and easily worked, and which is underlaid by an open and porous subsoil. Neither thrifty vines nor heavy crops of fruit can be produced on a sterile soil. On the other hand, if the soil be too rich, containing an excess of humus and nitrogenous material, as is usually the case with creek-bottom soils, the vines will make a rank growth, but the fruit will be small, imperfect, sour, and lacking in flavor. The presence of lime in the soil is always beneficial.

The character of the subsoil also is very important. The surface soil is easily changed and modified by cultivating and fertilizing, but the subsoil will remain practically unchanged. As the roots of the vines are easily injured by excessive heat and drought or by standing water, the subsoil should be of such a texture that the roots can penetrate below the reach of intense heat, and still not suffer from too much moisture. When the subsoil is loose and porous it not only permits surplus water to pass down through quickly, but it also assists the water from below in passing back to the surface in times of drought, thus securing to the vine the constant and uniform supply of moisture essential to its healthy growth. Soils underlaid with hardpan, those which are inclined to wash badly, and those which are not naturally well-drained should always be avoided when selecting a location for an extensive vineyard.

PROPAGATION.

Originating New Varieties.—Grapevines are propagated by seeds. layers, and cuttings, and by grafting. Progagation from seeds is employed only for the purpose of originating new varieties. Seeding grapevines may differ widely from the parent stock, and from each other, even when the seeds are from a single cluster of grapes; they require a long time to come into bearing, and their fruit is usually inferior to that of some of the established varieties. Nevertheless, it is by the raising of seedlings that all new varieties are originated, and the man who grows a hundred seedling vines feels amply repaid for all his labor and trouble if he finds among them a single one which produces grapes of superior quality.

Although propagating grapevines from seeds is rarely profitable, the work is of intense interest, and it is the only means by which new and better varieties can be secured. As work of this kind belongs to nurserymen and experimenters rather than practical grape growers, a full treatment of the methods is unnecessary here.

Layering.—All varieties may be propagated by layering, and many varieties, especially those like Norton, Cynthiana, Scuppernong, and other hard-wooded sorts of the Aestivalis and Rotundifolia classes can not be easily propagated by any other means. Layering should be done either in early spring or late in the summer, the spring layering being the more economical and making the better plants. For spring layering a trench of two or three inches in depth is dug, and a cane of the last season's growth is laid into it and fastened in place with a few wooden or wire pegs. When the young shoots from this cane have made a growth of from six to twelve inches, the trench should be filled with fine soil, well tramped in, and the shoots tied to stakes to keep them out of the way of cultivation. When treated in this way the canes laid in the trench will usually make both shoots and roots at each of the covered joints, and so make as many new vines as there are shoots. The trenches should be made lengthwise of the rows so they will be out of the way, and in digging the young vines should be separated by cutting the canes just beyond the shoot nearest the parent vine.

Layering may be done in midsummer by bending down and covering shoots of the present season's growth, but it is not often possible to secure more than one or two new vines from each shoot. If the layering is done very late in the season, it is safer to cut a tongue on one side of the shoot which is buried, making the tongue an inch or two in length and about one-third the thickness of the shoot, as roots will start more quickly from such a cut surface than where the bark is unbroken. When treated in this manner many varieties will make strong roots by spring, even when the layering is done as late as September or October. Propagation by layering is more sure than by cuttings, and it is often more convenient and satisfactory when only a few new vines are wanted. It has the further advantage of being practicable in summer when cuttings could not be made to grow.

Plants grown from layers are not so convenient for handling and planting as are those grown from cuttings, but there seems to be no difference in the growth or productiveness of the matured vines.

Cuttings.—When vines can be grown from cuttings, it is the simplest and easiest method of propagation. Cuttings of the Labrusca, Riparia, and some of the softer-wooded Aestivalis classes, root very easily. Cuttings should be made as soon as convenient after the leaves drop in the fall, and should be made from strong and well-ripened wood of the present season's growth. Each cutting should have at least three joints, and should be from eight to twelve inches in length. The cut at the lower end should be made just below a joint, as in fig. 1, *a*, or the cutting should have a short "heel" of old wood, as in fig. 1, *b*. The latter form is the better, but of course only one such cutting can be made from each shoot.

The top of the cutting should be an inch or two above the upper joint, and, as a matter of convenience in handling and planting, the cuttings should be of nearly equal length. They may be planted as soon as made, or may be tied in bundles and buried in well-drained soil until spring. The making of cuttings may be deferred until late in winter if necessary, but they are much better if made earlier. When made in the fall or early winter they have time to become well calloused, and so are more sure to form roots and grow promptly as soon as the soil becomes warm in the spring than when made later in the season.

Cuttings should be planted in loose, rich, and light soil as early in the spring as the ground is in condition for working. Dig a V-shaped trench, making one side straight and smooth, and a trifle less than the length of the cuttings in depth. Place the cuttings about two inches apart, against the smooth side of the trench, carefully press the lower end of each firmly into the soil, and have the top about even with the surface of the ground. Fill the trench nearly half full with fine soil and then tramp thoroughly, throwing the whole weight of the body on the heel so as to pack the soil very closely about the lower ends of the cuttings. Then fill the trench full, tramp again, and finish by drawing in loose soil to leave the surface level. As much of the success in growing cuttings depends on having good soil packed very closely about the lower ends, special care should be taken in that part of the planting.

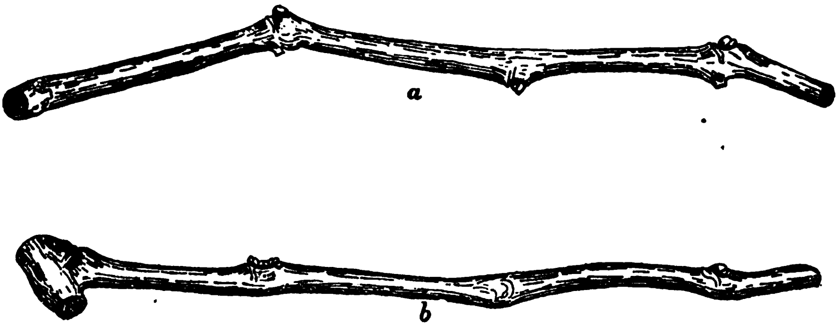


Fig. 1.—Grape Cuttings.

Cuttings may be planted more rapidly and more easily by simply opening the soil to the required depth with a spade, and pushing them down into place and then tramping the soil back against them, but when planted in that manner it is impossible to secure uniformly close contact between the soil and the lower ends of the cuttings, and success is much less sure. When properly made and planted in good soil, at least ninety per cent. of the cuttings of such varieties as the Concord and Niagara will grow; but of some other sorts like Norton and Cynthiana, not more than ten per cent. can be expected to make vines. The rows of cuttings should be at least four feet apart so as to give ample room for cultivation, and by the end of the season the young vines should have made a growth of from two to four feet or even more. They will then be ready for planting in the vineyard at any time after the first frost in the fall, or they may remain in the original rows until spring. This is the most common method of propagation, and fully ninety per cent. of the vines sold by nurserymen are raised in this way.

SELECTION OF VARIETIES.

Origin of Varieties.—While there are hundreds of named varieties of grapes in cultivation, nearly all of them come from less than a dozen of the twenty or more native species. These native species have been hybridized, crossed, and recrossed, until now a great many cultivated sorts have descended from two or more of the original types. A few varieties, like Herbemont and Norton, are simply wild sorts which have been domesticated; but by far the larger part of our present varieties have been selected from seedlings grown under cultivation Many of the older varieties, like Delaware, are accidental seedlings of which we do not know the parentage; but many of the varieties which have come into favor during the last twenty years have been grown from carefully selected seeds from varieties showing specially desirable qualities. Many thousands of seedlings have been grown from grapes the flowers of which had been fertilized with pollen from other varieties whose good qualities it was desired to combine with those of the fruiting vine, and from these seedlings most of our best varieties have been selected.

PLANTING, CULTIVATING AND FERTILIZING.

Laying Out a Vineyard.—In laying out a vineyard the rows should be made to run as nearly north and south as possible if the vines are to be trained on a trellis, but if only stakes are to be used the rows may be run in any direction. By running the trellis north and south all the fruiting parts of the vine have nearly the same exposure to the sun while the fruit, main stem, and roots are shaded and protected during the hottest part of the day. Protection of the soil from washing is of first importance, however, and the direction of the rows for any method of training should be made to conform to the slope of the ground when the vineyard is on the side of a hill.

Preparing the Ground.—In preparing the ground it should be plowed very deeply, as no loosening of the subsoil is possible after the vines are planted. An excellent plan is to plow the ground in "lands" the width of the rows, making the "dead furrows" come where the vines are to be planted, and running the plow through them several times so as to break up the subsoil to a good depth. This thorough loosening of the subsoil is especially necessary where an underlying hardpan prevents good natural drainage. It will be better if all the ground is subsoiled, and if the work is done some weeks or even months in advance of the planting. Just before planting, the ground should be plowed again, reversing the "lands," so as to make the ridge come where the furrow was. This should leave at least two feet of loosened soil where the vines are planted, and will afford the roots ample room for a free growth, besides doing much to insure them against suffering from drought.

Distance Apart of Vines.—The distances between the vines should be somewhat greater than is recommended for northern vineyards, as the longer growing season produces a heavier growth, and it is never profitable to crowd the vines too closely. The rows should be at least eight feet apart, and the same distance between the vines in the rows is close enough for such moderate growers as Delaware, Elvira and Gold Coin. Vines of the stronger growing varieties like Concord or Carman should be at least ten feet apart; twelve feet is none too wide for such rank growers as Fern, Laussel and Herbemont. Some give the stronger vines as much as sixteen feet, and find that distance none too great on good soil. Vines of the Scuppernong family should never be crowded, and eight by sixteen or twelve by twelve feet is close enough for them.

Planting.—Only strong, one-year-old vines from cuttings or layers should be used for planting. Two-year-old vines are usually larger and heavier, but do not often grow so well or make as good vines as those planted at one year, while the three and four year old vines sometimes sold "for immediate bearing" are of very little value. It is more economical and in every way more profitable to pay a good price for good vines than to use old, stunted, or unhealthy vines which cost nothing.

The holes in which the vines are planted should be of sufficient size to give room for the roots to be spread out in their natural positions, say from fifteen to eighteen inches in diameter, and deep enough to allow the vines to be set about two inches deeper than they grow in the nursery rows. Very little is gained by making the holes larger than is needed. Where they can be secured, it is very beneficial to put a few pounds of bones in the bottom of each hole and cover them with a little soil before the vines are planted. It is not usually possible to do this for a large vineyard, but where only a few vines are planted to furnish fruit for home use, a sufficient supply can commonly be found around a slaughter-house or in the fields, and they more than repay the trouble of gathering them. No other fertilizer need be used at the time of planting.

The tops of the vines should be cut back to two or three buds. In planting, the holes should be filled with the finest and richest soil. If the surface soil taken from the holes is rich, fine and mellow, it will be good enough, but if the vines are being planted in a hard clay or a light, sandy soil, it will pay to haul rich woods soil for filling about the roots. The filling should be packed and tramped down firmly, and a slender, five-foot stake set by the side of each vine, the stakes being kept in the line of the row, so as not to be in the way of cultivation.

All the vines of each variety should be planted together, and, as soon as the planting is completed, or while it is in progress, a complete record should be made, showing the location of all the vines of each variety.

Cultivation.—Grapevines need no special cultivation beyond that necessary to keep them free from weeds, and all the cultivation given should be very shallow, in order to avoid injury to the roots. Ordinarily the first working in the spring should be done with a one-horse turning plow, beginning in the middle and back-furrowing, so as to throw the soil away from the vines. The narrow strips left along the rows should be cleaned off with a hoe, fertilizers should be scattered in the open furrows on both sides of each vine, and the ground plowed again, the soil being thrown toward the rows at the second plowing, thus covering the fertilizer. For the later workings there is nothing better than an ordinary five-toothed cultivator and an occasional hoeing along the line of the row. Cultivation should cease when the growing fruit begins to weight down the vines, but as soon as the crop has been gathered the middles should be run through with a cultivator and the ground seeded with cowpeas or crimson clover, both for their fertilizing effect and for the protection they afford the ground during the winter.

Fertilizing.—The fertilizer should contain a large proportion of potash, with relatively small amounts of phosphoric acid and nitrogen. One of the best fertilizers is hardwood ashes, applied in the spring at the rate of half a bushel to each vine. When a few bones have been buried under the vines, and such an annual application of ashes is given to supply potash, cowpeas or crimson clover being grown between the rows, the fertilization will be ample to keep the vines in a vigorous and fruitful condition almost indefinitely.

When ashes are not available, any of the potash salts may be used. From half a pound to a pound of muriate or four times that amount of kainit should be given to each vine just before the second plowing in the spring. When bones were not used at the time of planting, an annual application of bone meal or of acid phosphate should be given in addition to the potash. Bone meal is usually more satisfactory, and, when acid phosphate is used, it is usually profitable to mix it with about half its weight of cotton-seed meal. Too much cotton-seed meal should not be used, as it will stimulate a too rank growth of unfruitful wood. Where the soil is rich in humus, or where a thrifty fall growth of peas or clover is secured, very little if any nitrogenous fertilizer should be used, but the vines will seldom be injured by excessive application of ashes, potash salts, acid phosphate, or bone meal.

PRUNING.

The training and pruning of grapevines is the most important item in their management, and it is in this part of the work that the greatest number of mistakes occur, although the principles involved are really very simple and easily learned by anyone who will give them a little thought and attention.

Definition of Terms.—The terms commonly used in speaking of the different parts of a vine are as follows (fig. 2):

A *shoot* is a green or immature growth less than one year old.

A *cane* is a matured shoot.

An *arm* is a cane two or more years of age, and is a permanent part of the vine, which is usually fastened to the trellis in a horizontal position, and on which the spurs and branches are produced.

A *branch* is a division of an arm or shoot.

A *spur* is a cane which has been shortened to from one to three joints; if left longer it is usually called a cane.

The *stem* is the permanent portion of the vine below the arms or canes. Where the stake or renewal system of training is followed the stem may be only a few inches in length, while in the canopy system of training it reaches to the top of the trellis.

Objects in View.—Most other fruiting plants do better with very little pruning, as the object is to secure the greatest possible amount of fruit from each plant and to make each plant grow as large as possible; but with grapes the object is to secure the greatest possible yield of fruit per square rod or per acre, and not per plant. While a single grapevine bears less fruit when trained to a trellis and kept pruned to a few feet in length than when allowed to grow at will over the tops of trees, the yield of fruit in return for the time, labor and expense is much greater when the vines are restricted to a convenient size and are trained in a somewhat unnatural form; hence, in cultivation, extended growth of vine is sacrificed to secure an increased yield of fruit.

The objects to be kept in view in pruning are to keep each vine within its allotted limits and make it assume the form desired, to remove any useless parts and so secure a more vigorous growth of productive wood, and to remove an excess of fruit. It should always be kept in mind that the fruit of the next season will be borne on shoots of this season which were produced on wood grown last season, and that it is usually desirable to remove as much of the old wood as is possible and at the same time to leave as much of the new wood as the vine can support with a thrifty and fruitful growth. As each bud on the spurs will probably produce a new shoot, and as each shoot will ordinarily produce from two to six clusters of fruit, the number of clusters being quite uniform for each variety, the amount of fruit which may be expected from each vine can be estimated quite closely, and the pruning should be done accordingly. When too much bearing wood is left and the amount of fruit produced is excessive, both the clusters and the berries will be smaller, and the vine may be so weakened as to require several years to recover a healthy growth. Too close pruning should also be avoided, as it lessens the opportunity for fruit bearing, and causes an excessive growth of coarse and sappy vine. The after effects of too close pruning are rarely harmful to the vine, and there is far less

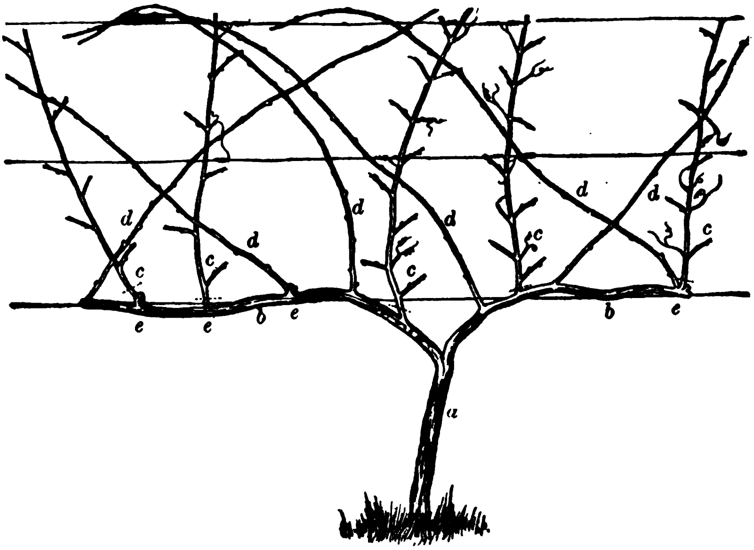


Fig. 2.—Vine Ready for Pruning; *a*, **the Stem;** *b*, **Arms;** *c*, **Canes;** *d*, **Shoots;** *e*, **Spurs.**
The faint lines near the bases of the canes indicate the points where they should be pruned off in the winter, leaving spurs for the production of shoots the following season.

danger in pruning too closely than in permitting the vine to grow at will or to produce an excessive crop at the expense of its future thrift. The natural tendency of a vine is to make its most vigorous growth from the buds farthest from the roots, and, whatever method of pruning and training may be adopted, the aim should be to confine the growth very near the root or main stem.

Time of pruning.—In winter pruning, ordinary varieties should have from one half to three-fourths of the entire vine cut away. This work may be done at any time after the leaves drop in the fall, and should be done before the buds begin to swell in the spring. Late pruning is better than no pruning, but permits a great loss of sap which would have been used in the development of new growth if the work had been done at the proper time.

Summer pruning is of great value in giving the vine its desired form, in removing an excess of fruit, in making that which is left larger and of better quality, and in making the next winter pruning simpler, easier, and more satisfactory. This summer pruning should begin by the removal of surplus shoots as soon as the first growth starts in the spring, so that the entire strength of the vine may be used in the directions where it is wanted, and should be repeated two or three times at intervals of a week or ten days. In many vineyards this is the only summer pruning given, but the vines will bear more evenly, produce better fruit, and be longer lived if any excess of fruit clusters is removed as soon as they appear, and if the fruit-bearing shoots are broken off so as to leave only two or three joints beyond the last cluster of fruit. All summer pruning should be done so early in the season and so promptly that no tools are needed for the work; it should all be done while the new shoots are still so young and tender that they are easily broken off with the thumb and finger. When the wood has become so firm that it will not break easily it may as well remain on the vine until the next winter. Pruning late in the summer, or the removal of leaves so that the sun will hasten the ripening of the fruit, is never profitable. It costs time and strength for the vine to develop leaves, but when they are once fully grown they become feeders instead of consumers, and every one should be preserved.

As the system of pruning adopted must depend on the style of trellis used, the subject will be treated further in connection with systems of training.

TRELLISES AND SYSTEMS OF TRAINING.

A trellis is not needed to give the vine support, and pruning is necessary to secure the most fruitful growth. The best trellis is one which permits all parts of the vine to grow without being crowded; which holds the vine in such a position that all parts can be easily seen and reached for pruning, spraying, and gathering the fruit; which does not interfere too much with cultivation; which allows the fruit to hang in such a position that it is protected from the scorching rays of the sun; and which is inexpensive. Each style of trellis has its advantages as well as its disadvantages; the one to be adopted for any vineyard will depend somewhat upon the varieties of grapes to be grown, and still more on the personal preference of the cultivator.

Training to Stakes.—The most simple and inexpensive form of trellis is a stake set at each vine, and as this method of training affords an opportunity for cultivating in both directions it is preferred by many. Weak-growing varieties do well when trained to single stakes, but all strong-growing sorts should have two stakes at each vine to avoid too close crowding of the canes and shoots. The stakes should be five or six feet in length, two or three inches in diameter, and of durable wood which will last as long as the vine is likely to live. When inferior wood must be used the stakes should be a foot longer, so that when the lower ends decay they can be reversed and used again.

One stake should be set when the vines are planted. The growth of the first year should be confined to a single cane, which should be kept tied to the stake, and the only pruning needed will be to rub off any additional shoots which may start from near the ground on the old wood. This removal of surplus shoots should be done as often as once in two weeks during the spring, as it is desirable to force all the strength of the vine to go toward making a single, strong cane. Some time during the next winter the vine should be cut back so as to leave the cane not more than four feet in length. From two to four of the side shoots may be left with two or three joints each, and all others should be removed.

The next spring several shoots will start from near the root, the best two of which should be tied to the stake, and all others should be removed as soon as they appear. If two stakes are to be used for each vine the second one should at this time be set on the side of the vine opposite the first, and the new shoots should be tied to the new stake, while the old cane remains on the old stake. The two shoots which are saved should have their tops pinched off as soon as they reach the top of the stake, so as to induce a stronger growth of the side branches. The single cane from the previous season may produce a few clusters of fruit, but should not be allowed to bear so much as to check the vigorous growth of the new shoots. Two or three clusters on each spur will usually be all that the vine should support.

At the end of the second season the old cane should be cut off just above the two new ones, the latter should be cut off a little below the tops of the stakes, and from three to five spurs of two or three joints each should be left on each, and one of them should be tied to each stake. From this time onward the winter pruning and training will be nearly the same each year. Two new shoots should be allowed to grow from as near the ground as they can be secured, and the old canes cut away as near the ground as possible, one of the new shoots and one of the old canes being trained on each stake.

This is the cheapest and simplest trellis which can be devised, but has serious disadvantages in that it crowds the vines and fruit so that both suffer from want of air and light; it does not afford a good opportunity for spraying; the growth is so dense that it is often difficult to see and gather the fruit; and, the soil on the south side of the vines not being shaded, the roots often suffer from heat. This method is much better adapted to the weaker growing sorts, like Delaware, than to stronger varieties, like Niagara, and is wholly unsuited to such rank-growing vines as Herbemont.

Wire Trellises.—For building a wire trellis the posts should be about seven feet in length, so that the tops will be at least five feet above the surface of the ground. They should always be made of the most durable wood obtainable, as it is very troublesome to replace one which has rotted off, and if one fails during the summer there is sure to be a considerable loss of fruit and injury to the vines. The posts at the end of the rows should be heavier than the others, and should be set at least eight feet from the fence, so as to leave room for a horse to turn in cultivating. The end post should be from four to six feet outside of the first vine, while the second one should be half way between the first and second vines. These two posts should be double tied by heavy wires or one by six inch boards running diagonally from the top of each one to the bottom of the other and fastened together where they cross in the middle. As a good part of the strain from the entire trellis comes on these posts it is important that they should be set firmly and well braced. The other posts should be set at twice the distance between the vines. Galvanized wire, not smaller than No. 12, should be used. Three wires will give much better satisfaction than two, and these may be stapled to the sides of the posts at about twenty, forty and sixty inches from the ground, or may be fastened to crosspieces resting on the tops of the posts.

Training on Vertical Trellis.—When the wires are fastened to the sides of the posts so as to make a vertical trellis, the training of the vines may be made to follow any one of several methods—the two more common methods being the "fan" and the "horizontal arm" systems. When the fan or renewal system is adopted, the pruning should be very similar to that practiced when the vines are trained on stakes. Two or three shoots are grown from near the ground each year, and are tied to the wires in any convenient position, the ends being cut off when the shoots are four or five feet in length. At the winter pruning, all the old canes are cut away just above where the new growth started, and the young canes are shortened to a length of three to five feet. From three to five of the side branches on the young canes are shortened to spurs of two to four joints, and all the others are removed. The canes are then tied to the wires in a fanlike position, so as to allow each one the greatest amount of room. When trained in this way, nearly the whole vine is renewed each year, as is also the case when stakes are used, and there are many varieties which produce much better so than when trained with a long, permanent stem. One of the principal objections to this method is the fact that it is often impossible to secure the desired number of shoots from near the ground. Frequently a vine makes no vigorous shoots excepting well up on the bearing canes two or three feet from the ground. In such cases the only thing to be done is to save the best shoot nearest the bottom of each cane, and then prune as described above. Ordinarily a variety which persistently fails to produce shoots from near the ground will make a better growth and yield more fruit if trained to form permanent arms.

THE FRUIT.

Sacking the Bunches.—The surest way to secure fine bunches of perfect fruit is to sack each cluster when the grapes are no larger than small shot. For this work the grocer's ordinary paper bags, of the two or three pound size, are used, and afford very complete protection from attacks of fungi, insects, and birds. The bags should be put on as soon as possible after the fruit is set, and the work can be done very rapidly. The bags should have a small piece cut off from one of the lower corners, so that they will not hold water after heavy rains, and they should not be larger than are needed or many will be torn off by wind. In putting them on, the mouth of the sack is opened by grasping it by the longer edge and giving it a quick jerk; it is then slipped over the bunch of fruit, the mouth is doubled and folded around the stem, and fastened in place with a pin. The cost of the work, including bags, pins, and labor, does not exceed one-half cent per pound for the fruit, and so it is often very profitable, especially where there is a demand for fancy fruit at something above the usual market price. Sacking in this way gives complete protection from rot and mildew and so insures perfect bunches. It prevents attacks from wasps and other insects, and preserves the bloom on the fruit so as to make the bunches much more attractive in appearance than when they are exposed to beating winds. The more tender and thin-skinned the fruit the greater will be the benefit secured by the work.

Ringing or Girdling.—Ringing or girdling the vines is sometimes practiced to hasten the ripening of the fruit and to increase its size. The operation consists simply in removing an entire ring of bark, from one-fourth to one-half an inch in width, from around the arm or cane which bears the fruit. It is very quickly done by passing a knife around the vine twice, with sufficient pressure to cut only to the wood, and then taking out the narrow ring of bark between the two cuts. The work should be done early in the season, soon after the fruit sets, and should be practiced with caution, as the part of the vine treated will be of no further use and should be removed at the next pruning. Fastening a wire closely about a branch will produce nearly the same results, and is equally destructive to the vine. The practice has been in use many years, but it is not one which is likely ever to become common. It can be followed to advantage when a few specially fine clusters are wanted early in the season for exhibition purposes, and, as the girdling hastens the ripening of the fruit a week or ten days, it is sometimes profitable when early fruit is grown for market. As girdling kills the branches on which it is done, and the whole vine is often weakened by the unnatural treatment, the practice can be recommended as desirable or profitable only in special cases.

Gathering and Packing.—For home use or for making wine, grapes should not be picked until they are fully ripe. Many varieties become highly colored some days, or even weeks, before they are fully matured; but they are not really ripe and in the best condition for use until the stem of the bunch begins to shrivel or soften so that it can be easily bent. Even for market, the fruit should not be gathered until very nearly matured, as it ripens but little after being removed from the vine. The unripe fruit may soften somewhat on its way to market, but does not become sweeter or better flavored, and will retain the excess of acid which disappears when the grapes are ripened on the vines.

Gathering grapes for market should be done only in fair weather when the vines and fruit are not wet with either dew or rain. The stems should be cut with a knife or scissors and the bunches should be laid in shallow wooden trays or baskets for carrying to the packing shed. Baskets holding five, eight or ten pounds, with covers fastened on by wire hooks, are the best packages in which to ship, as they are inexpensive, easily handled in transportation, and convenient and tempting to purchasers. The fruit should be allowed to lie a few hours so that the stems will become slightly wilted; and all diseased, unripe, or bruised berries should be removed before packing begins. The bunches should be placed in the baskets with the stems downward, and packed snugly, the smaller bunches being used to fill the spaces between the larger ones. The top of the fruit should be about half an inch above the top of the basket and should be even and level. The baskets should be so full that some pressure will be needed to bring the cover down into place, though the pressure should not be so great as to crush the grapes or break them from the stems. A basket which is not packed closely will never carry the fruit in good condition; and, as the fruit is sold by weight, close packing is economical. The name of the variety, as well as the name and address of the grower, should be stenciled on the tops of the covers before they are put in place. Mixed or inferior fruit will seldom pay for shipping and will never add to the good reputation of the grower.

THE GRAPE-BERRY MOTH

(*Eudemis botrana Schiff.*)

As the grape berries become full grown and begin to ripen, often many of them will be observed to be discolored, and if these be examined a burrow will be found eaten through the pulp from the discolored spot, and within it a whitish larva. These injured berries begin to appear while the fruit is young and green, and as it ripens they increase in number. Frequently several of these discolored and shriveled berries will be fastened together by silken threads intermixed with the excrement of the larvae and the sticky grape juice, the larva having passed from one to another. The appearance is not unlike that produced by black rot, and is often confused with the latter. As the larva becomes mature it changes to an olive-green or dark-brown color, and not only excavates the pulp, but burrows into the seeds of the grape.

Remedies.—The use of poisons is not practicable except against the first brood, which develops on the green parts of the vine, and here the result is doubtful, because it is more than likely to breed on a great variety of foliage, and spraying would not afford much protection. Bagging the grapes as soon as the fruit sets will undoubtedly protect them from this insect, and at the same time from black rot. Of greater practical value, especially in larger vineyards, is the prompt collection and burning of all fallen leaves in autumn, thus destroying the hibernating larvae and pupae, and also the collection and destruction of diseased fruit wherever feasible. Early gathering and shipping or diposal of fruit otherwise is a particularly valuable step, as it insures the removal of the larvae in the grapes from the vineyard if not their destruction in wine making. All fallen fruit should also be gathered and destroyed.

FUNGOUS DISEASES AND THEIR TREATMENT.

The fungous diseases which affect the grape most seriously are black rot (*Laestadia Bidwellii* Sacc.), anthracnose (*Sphaceloma ampelinum* DBy.), bitter rot (*Melanconium fuliginium*), and root rot, caused by the mycelia of several fungi. These have been so fully described in previous bulletins of this series, as well as in bulletins from many of the State experiment stations, that descriptions need not be repeated here. Other diseases are often present, but are rarely so virulent as to cause serious trouble. Nearly all the fungous diseases which effect the vine, leaves, or fruit can be prevented or held in check by spraying with fungicides, and the same general treatment is recommended for all. Thorough and frequent sprayings are the most effective treatment which can be given.

Spraying.—No effective spraying can be done without the use of some kind of a force-pump having a nozzle which will divide the spray into a fine mist. Where there are only a few vines to be treated the small syringes such as are used by florists, costing from $1 to $1.50, are very serviceable. For a larger number of vines, twenty-five or more, some one of the many knapsack sprayers with a vermorel nozzle, costing from $9 to $12, will be found much more satisfactory, and also very useful for spraying many other plants, both with fungicides and insecticides. If the vineyard is an acre or more in extent, it will be still more economical to mount a strong force-pump in a barrel which can be carried through the vineyard on a cart or a light wagon. Force-pumps mounted on handcarts are sometimes used, but are too heavy to be moved about easily when the ground is soft.

The first spraying should be given in early spring, just as the buds are beginning to swell and before they open. This spraying should be made with a solution of copper sulphate or bluestone, using one pound of the sulphate to each ten gallons of water. Other sprayings should follow from ten to fifteen days apart.

Bordeaux Mixture.—The fungicide to be used is Bordeaux mixture, a preparation of copper sulphate and lime.

The proportions of copper sulphate and lime are often varied from the amounts just given, especially when the same mixture is to be used on fruit trees. It is not safe to increase the amount of sulphate, but five pounds each of sulphate and of lime and fifty gallons of water are often used. As the mixture is most effective when first prepared, a new lot should be made up for each spraying, though the separate solutions may be made in advance. The following method is given in the Twenty-second Report of the Connecticut Experiment Station:

Half a pound of copper sulphate is dissolved in a quart of hot water and poured into a fruit jar of that capacity; half a pound of lime is slacked, diluted with water to make a quart, and placed in another fruit jar. These amounts are easily weighed out, the operation of dissolving and slacking can be done quickly, and in a couple of hours enough half-pound lots of sulphate and of lime can be prepared to make a good many gallons of Bordeaux mixture, and if the jars are tightly closed their contents will keep indefinitely. To make five gallons of Bordeaux mixture an ordinary wooden pail holding two and one-half gallons and a forty pound (five gallon) candy pail, such as can be cheaply bought of any grocer, are needed. Into the latter is poured the contents of one jar of lime, and the pail is then half filled with water. Into the small pail is emptied a jar of copper-sulphate solution, and this pail is then filled with water. Finally, by pouring the contents of the small pail quickly into the large pail and stirring well a perfect Bordeaux mixture is obtained.

Where only small amounts of the mixture are needed for each spraying, it is more convenient to prepare the solutions as directed above than to procure fresh lime and go through the entire operation for each of the four sprayings usually given with this mixture.

No spraying should be done while the grapes are in bloom, and in rainy weather the sprayings should be more frequent than in times of drought, though more than fifteen days should never elapse between them.

As a fresh application of Bordeaux mixture will adhere to the fruit and make it unsightly, the last spraying should be made with a solution of six ounces of ammonia carbonate and one ounce of copper carbonate in ten gallons of water.

The entire expense for labor and material for making the six sprayings recommended will not be far from three cents per vine, and as that is less than the usual price of one pound or fruit the work is always profitable.

If the spraying is begun early in the season, and is always promptly and thoroughly done until the fruit begins to color, the losses from disease will be very light. Sprayed vines will be kept in so much more healthful condition that an increased crop may be expected the following year, while an untreated vine which is weakened by disease will usually become still weaker and less fruitful each year until it dies. It should be understood that the object of spraying is not so much to cure disease as to prevent its appearance, and the most thorough spraying of diseased vines or fruit can do but little good excepting as it prevents a further spread of the trouble. While sacking will save most of the fruit from rot and other diseases, it can not protect the leaves and shoots. Heavy crops of good fruit are possible only on healthy vines, and with many of the choicest varieties such vines can be maintained only by persistent spraying.—*United States Bulletin 118.*

GROWING ALFALFA IN VIRGINIA.

Alfalfa is one of the most profitable crops that our farmers can grow There is a vast quantity of land in Virginia that will grow alfalfa very profitably. Many farmers have experimented in growing alfalfa in a small way without having the proper knowledge on how to grow it; consequently the experiments were mostly failures and the conclusion was reached that alfalfa would not grow in Virginia. But the recent success made in King George county where 400 acres in alfalfa were harvested this year, producing a crop worth probably $35,000.00, shows conclusively that it is one of the most profitable crops the farmer can grow. Every farmer ought to have at least a few acres to feed his

First Cutting, May 12—Captain Jack's 400-Acre Alfalfa Field.

own stock. It is the finest feed for young stock of all kinds; it takes the place of wheat bran largely in the dairy; it is a great milk-producer and is very profitable to feed to cows and ewes. A work-horse will thrive on one-third less grain when fed alfalfa hay. In addition to the value of the feed of this plant, it is also a fine improver of the soil, being a nitrogen gatherer. The long roots penetrate the soil at a depth that no other crop has ever reached so that the farmer who grows alfalfa is cropping about three feet in depth.

The accompanying article on growing alfalfa in Virginia, prepared by Mr. M. Zimpelmann, is brim full of valuable points that will be helpful to any farmer who desires to grow alfalfa in this State. Mr. Zimpelmann has grown alfalfa for years in the West, is thoroughly familiar with the crop and says he has grown as fine alfalfa in King George county as he has ever grown elsewhere.

At the last State fair the department made an agricultural exhibit, the principal feature of which was alfalfa. Several tons of baled alfalfa hay were on exhibition. Mr. Zimpelmann and others lectured daily to our farmers on growing alfalfa in Virginia. The lectures were largely attended showing an increased interest in the farmers as to growing this crop. One farmer reports that he has sowed this year 100 acres in alfalfa, and a number of others have sown small acreage. In a few years, it is believed, the crop will be grown extensively in many sections of the State.

PORT CONWAY, VA., *November 7, 1910.*

HON. G. W. KOINER, *Commissioner of Agriculture,*
Richmond, Va.:

MY DEAR SIR: Your question, and that of many others, "Can alfalfa be grown successfully in Virginia?" has been answered most emphatically by Mr. Jack on the Belle Grove and Walsingham Farms, for he has here sufficient living testimony to convince the most sceptically inclined critic.

The above-quoted question was uppermost in farmers' minds during the State fair for it was asked me more than any other, and as I was there to disprove any statement to the contrary, I could but point out what has been done here and let them draw their own conclusions. There were those who *knew* they could not grow the plant, and to those I would say, "Leave it alone," for when a man makes up his mind to make a failure of anything, he usually accomplishes it, while the man full of pluck and energy to achieve and wide awake to improve every opportunity, succeeds. Doubtless many theories have been sent broadcast over Virginia pertaining to the growth of alfalfa. Numberless people told me that they could not grow it, that they had done all they had been told to do and yet had failed. Had they failed? Let a man have what he calls a "bad cold" and everyone he meets on the street has an unfailing remedy to prescribe for him. If he were to try them all he would surely die of the overdose, and I doubt not that such has been the case with many so-called attempts at alfalfa-growing.

Let us then look at it in a common-sense way—as farmers, not as theorists. Alfalfa, no matter where it may have originated or whence comes its name, covers a larger area of country than any other known forage plant. It is being grown from Maine to California, from Texas to the British Northwest. It is found in Asia from Siberia to the Red Sea, and grows equally as luxuriant on the borders of the Arabian Desert and Tartary as it does in the cooler mountain valleys. In Europe it is grown from Norway to the peninsulas of Spain and Italy, and attains to highest perfection across the Mediterranian in Algeria and Morocco. In going over all these lands there must needs be a great variety of soils as well as of climate, and yet in many of them alfalfa is the main-stay and stand-by. Why then should it not grow in Virginia? But it does grow in Virginia, luxuriant and succulent as it ever grew in any country. Visitors were many during the past summer on Mr. Jack's alfalfa farm in King George; they were from nearly every State' and when I asked, "Does this look as well as it does out in your country?' the invariable reply was, "Better."

Mowing Alfalfa in Virginia

When a boy in eastern France, I saw it grow and yield four and five cuttings where red clover could make but two. I have heard its feeding properties lauded to the skies and seen them demonstrated. There it was known as "eternal clover" owing to its long life. I remember seeing a field plowed up which had been seeded down nineteen years before and still yielding five cuttings per year. Every one tried to dissuade the owner, but he wanted to see what kind of a crop of wheat he could make after it. He was not disappointed; a magnificent crop of wheat followed: but it has always been a question in my mind as to whether or not it paid him, and I still doubt it.

My people always grew alfalfa for a forage crop to feed green; we hardly ever had any for hay. It was considered too valuable a stock food from earliest spring to late fall when all else failed.

I well remember a newly-acquired field some distance from the house. It was known as white-clay land and considered poor. When it had been plowed and sown to winter barley I was allowed to drive the team and harrow the field, and how high I stepped! The following spring the alfalfa seed was sown on the surface when a late, light snow was on the ground. After harvesting the barley, there was a fairly good crop of hay in the fall. All the fertilizer put on was finely-ground gypsum. This was usually put on early in the spring, and years when there was none to put on the alfalfa was not as dark green as when treated with gypsum.

This was an early boyhood lesson that alfalfa needed lime on most soils. Other clovers and grasses need it, but we lay less stress on their not coming into perfection; we expect less of them than we do of alfalfa and do not cuss quite as freely as we do when we think the plant has not treated us quite as well as we think it should. My mother used to tell me that "fried pigeons" would never fly into my mouth, that I would have to shoot and fry them. This has applied to all phases of life, and I would say to prospective alfalfa growers that the plant is not at fault in your failures. The trouble lies with you. The statement above relative to the wide field covered by alfalfa is sufficient evidence that most any climate and most any soil is conducive to the health of the plant. Local conditions must be fitted up to its needs and wants, and may be summed up as follows:

1. Select well-drained soil, either naturally drained or by tile; if the latter, see that the tiles are laid deep enough in the ground, for alfalfa refuses to live in cold, wet and clammy soil—it is not its home.

2. Variety of soil cuts very little figure, providing the soil has sufficient humus or plant food in it to lighten it and give it texture and fibre. Land that has been continually plowed and cropped becomes soggy; it cannot breathe; no air passes through its lungs. Fertilizers used have made it sour and from two to five tons of lime are necessary to correct the acidity.

To obtain the necessary humus the land should be sown in peas or crimson clover and plowed under in its green state. It should be plowed six inches deep so as to cover all the growth, and then leveled well and if possible rolled so as to stop any evaporation when the green mulch decays. As soon as any weeds start, harrow well and destroy all sprouted weeds. If the land is very poor it is well to plow under a second crop of peas or clover and treat likewise. If the land is very weedy, use them as green fertilizer instead of peas or clover. Plow when they have attained a good growth in May and again when the next batch is tall enough. This cleans the field and produces humus at the same time.

3. The great drawback to any permanent crop is the so-called wire grass and this should be eradicated before seeding a field to alfalfa. If the alfalfa is thick enough on the ground and makes a vigorous growth from the start, it will in time smother out the wire grass, but if slow in starting the wire grass will take root enough to always bother more or less. To thoroughly clean land of that kind it is best to summer fallow, plowing at regular intervals every time the wire grass has made a new start and the young grass shows on the surface. In the interval between plowings, the land should be harrowed thoroughly and the horse-rake used freely in order to gather all of the roots and grasses and remove from the field. This is the only way wire grass can be fully subdued, and besides a summer fallow is one of the best fertilizers in itself.

4. Having observed the above advice and carried it out and thus gotten the land free of wire grass and comparatively so of other weeds, we are ready for a coat of lime. Experience here has shown us the

A Virginia Cattle Ranch.

desirability of using not less than two tons per acre and as high as five tons to obtain the very best results. Results are what we are all after. Disc and harrow the lime in well and get your field level preparatory for the seed bed. An application of about three hundred pounds of bone meal per acre, and I may say, preferably acid phosphate instead of the former, as it may give quicker results. Harrow this in and the land is ready for the seed. It is best to sow thickly and from twenty-five to thirty pounds of good seed is necessary to insure a good stand. Be sure and have the seed tested as to germination and cleanliness—that is, have it free of weed seeds. At the same time the seed is sown, the land should be inoculated with soil from a good alfalfa field, sowing the dirt at the rate of two hundred to three hundred pounds to the acre. If inoculated soil cannot be obtained handily or without too much cost, use the inoculated seed; it can be had of the Department of Agriculture at Washington. When both seed and soil are sown, follow immediately with the harrow, the bacteria in either soil or seed will not stand exposure to the sun without material injury to future growth. At this harrowing slant the teeth well back so as not to cut the land full of little furrows, nor cover the seed too deeply. I would further recommend rolling the land; this presses the soil around the seed and makes germination more even, especially in dry weather.

Putting On the Lime.

5. Generally speaking, seeding alfalfa without a so-called nurse crop, or in other words, sow it by itself is most successful. The best time for Virginia seems to be from the middle of August to the middle of September. I would repeat, use plenty of seed and be sure to have clean, new seed. I would not advise later seeding than above mentioned as the plant does not make sufficient growth of root or top, before frost kills it, to protect itself during the winter.

6. If the following spring there is a good showing of alfalfa, do not worry about a few weeds nor over crab grass that may show later in the season, perhaps in the third cutting. Cut the alfalfa when it comes into bloom and repeat the operation with the next growth. In a dry time the plant may become a little yellow at the top; it may even seemingly cease to grow. In such a case cut it, no matter how small, and if possible, give the field a coating of lime of one or two tons per acre. If dry weather continues and the alfalfa seems to have disappeared, do not worry, it will be there when spring comes. If possible a top dressing of barnyard manure should be given, put on with a spreader so as to have it evenly distributed. This, however, should never be done with new seeding, as it will smother out the young plant. I said, "Do not fear weeds." If the alfalfa is thick enough on the ground, it will smother out all weeds in time, and the frequent cuttings not permitting them to seed will kill them. Surface grasses, such as crab grass coming from seed in the soil, will soon be exhausted as the seed near enough to the surface to germinate will all be sprouted in a year or two and thus exhaust themselves.

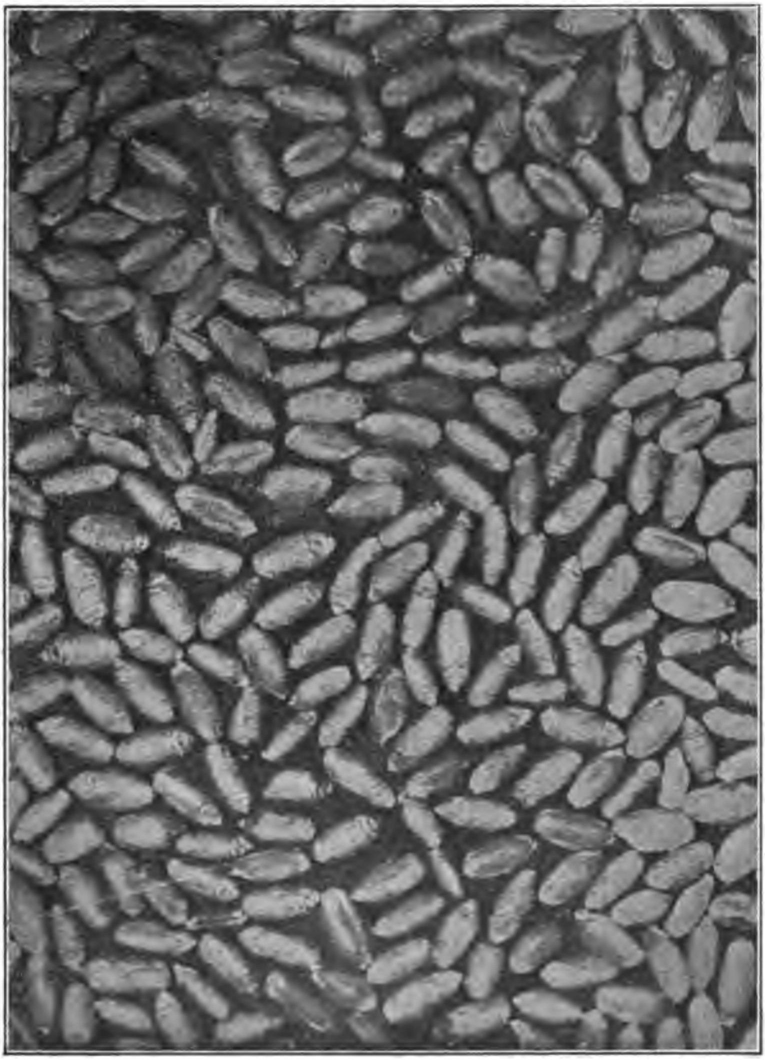
Alfalfa Plants Two Years Old, Showing Portion of Roots which were Four Feet Long.

Note then the few principal points necessary to successful alfalfa-growing and remember that the work as outlined is absolutely necessary. Do not expect success unless you have done this work well, though in some cases it might succeed. Do not expect large crops of alfalfa unless you have fed your land accordingly, any more than you would expect fried pigeons to fly into your mouths. Shoot and fry your weeds and wire grass and remember: land well drained—land lightened with humus—land freed from weeds—land sweetened by lime—land well tilled for a seed bed—land well seeded with plenty of good seed—land well inoculated and firmly packed!

M. ZIMPELMANN.

VIRGINIA SHOULD GROW MORE WHEAT.

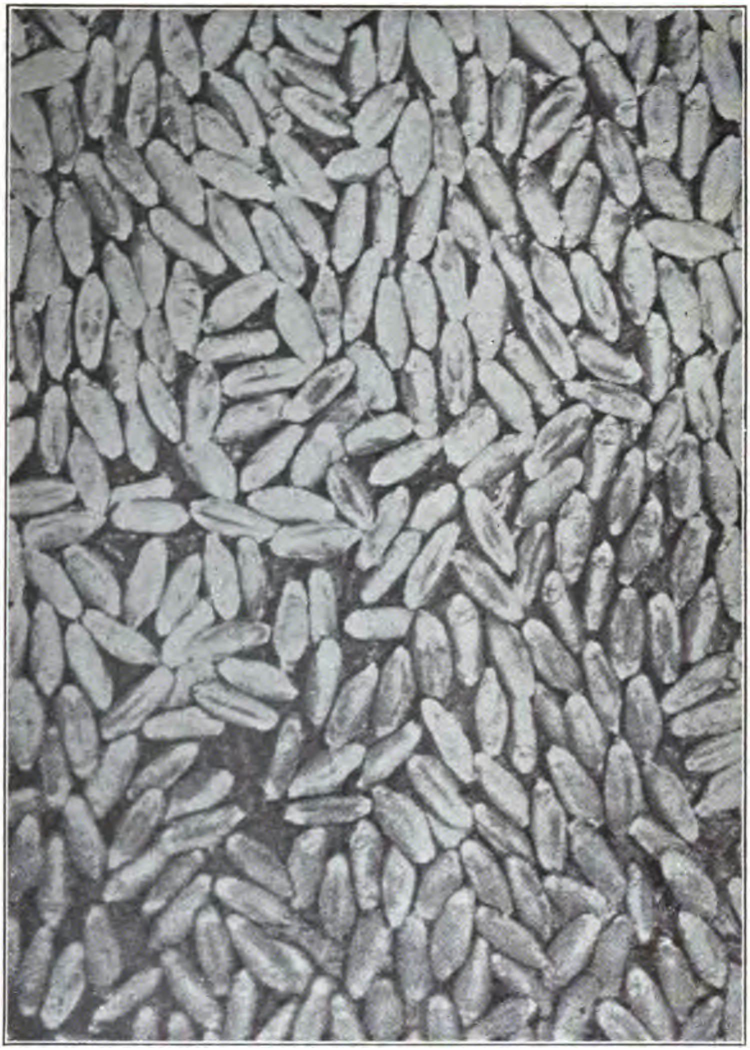
The average yield of wheat in this State is not what it ought to be. If our farmers would pay more attention to the preparation of their lands for the wheat crop, and to the selection of seed, much larger yields could be obtained without any additional cost. The average yield of wheat this year is nearly two bushels more per acre than last



One of the Most Desirable Types of Wheat for Seed; the Grains are Thick and Blunt at the Ends with a Shallow Crease; Milling Qualities are More Flour and Less Bran.

Possibilities in Wheat Growing. This Field Made Fifty-five Bushels per Acre.

year. Nearly 800,000 acres were in wheat this year. The great possibilities in growing wheat should encourage every wheat-grower. There is a picture, shown in this report, of a wheat-field in England that produced last year fifty-five bushels of wheat to the acre. There is a long distance between the yield in Virginia and the average yield in England which is about thirty-five bushels per acre. Some farmers in this State have made forty bushels. The average in Virginia this year being



This Quality of Seed Wheat Should Not be Sowed; the Long Narrow Tapering Grain with a Deep Crease is Peculiar to Some Type.

Yield, Nearly Forty Bushels per Acre.
Virginia needs more wheat fields like this one. Owner, T. W. Allen, Shenandoah county.

practically thirteen bushels shows that a great many farmers grow less than that quantity per acre. It is more expensive to grow a small yield than a large one in some respects. The selection of seed is a very important matter in securing large yields, and the accompanying cuts illustrate this point.

It will pay wheat growers to give careful attention to the breeding of seed wheat. This has been demonstrated beyond question in various parts of the country. One breeder has increased his yield nearly six bushels per acre in four years simply from breeding up his seed.

There are several methods used in breeding seed wheat. A simple method is systematic selection of the best yielding heads and planting them in a plot in the garden or at some suitable place on the farm. Select the best heads from this lot next year and plant them again. In a few years enough seed will be secured to seed an acre, and from an acre sufficient seed will be secured to sow a field, etc.

Another method, which may lead to a new variety, is selecting chance large heads or sports of wheat. Often valuable varieties are started in this way. One breeder in Virginia has established a very valuable new variety by planting a single head of fine qualities, which he discovered growing in his garden, by following the process above described.

PEANUTS.

It is not definitely known when and where the peanut was first cultivated. Several allied species of plants are natives of Brazil, and there is every indication that the common peanut originally came from tropical America. Peanuts were introduced into the United States during the earlier days of colonization, but did not become of commercial importance until about 1870. From that time until 1897 the growth of the peanut industry was gradual, but a great increase in the production and use of peanuts has taken place during the last eight or ten years.

Botanically the peanut belongs to the same group of plants as do the beans and peas, but it possesses the character of maturing its fruit or nut beneath the surface of the soil rather than above ground, as do most other leguminous plants. The technical name of the peanut is *Arachis hypogea,* the name indicating the characteristic habit of the plant to mature its fruit underground. The peanut is known under the local names of "goober," "goober pea," "pindar," "ground pea" and "groundnut." The names "goober" and "goober pea" are more properly applied to an allied species having no true stem and only one pea in each pod which has been introduced and is frequently found growing wild in the Gulf Coast States. Properly speaking, the peanut is a pea rather than a nut, the term "nut" having been added on account of its flavor, which is similar to that of many of the true nuts.

The small, yellow flowers of the peanut are borne in the little pocket where the leaves are attached to the stems, and as soon as pollination has taken place the visible portion of the flower fades and falls, after which the short, thick stem that supports the lower portion of the flower elongates and the sharp-pointed ovary is thrust downward into the soil, where the pod develops. Should the ovary fail to reach or penetrate the soil no pod will be formed.

The value of the commercial peanut crop of the United States for the year 1908 was estimated at $12,000,000. During recent years the area of production of peanuts has greatly increased, especially throughout the warmer parts of the country. The value of the peanut, both as a money crop and for feeding on the farm, renders it especially desirable as a part of the rotation wherever conditions suitable to its development exist.

SOIL AND CLIMATIC REQUIREMENTS OF THE PEANUT.

The soil best suited to the peanut is one of a sandy, loamy nature, preferably light or grayish in color rather than dark. Soils that are dark and those carrying a considerable percentage of iron or other mineral are likely to stain the shells of the peanuts, thus rendering them less desirable for the trade. For agricultural purposes, however, the staining of the shells is of little consequence, as it does not materially injure them for stock-feeding. In fact, soils that contain considerable clay and lime or are loamy in character produce heavier nuts and sometimes greater yields than do lighter soils. As a rule, the peanut does best on a sandy loam with a well-drained clay subsoil, but the crop may be grown under a wide range of soil conditions. Soils that become hard or compact are not adapted to peanut-growing, owing to the inability of the pod stems or "pegs" to penetrate the surface.

Soils that are poorly drained or sour are not suited to the peanut. The ideal soil consists of a sandy loam containing a reasonable amount of humus, or vegetable matter, together with an abundance of lime. A soil having a suitable mechanical consistency is the first essential. Soils lacking in fertility can be improved by a proper cropping system or by the judicious use of manures.

PREPARATION OF THE SOIL.

Time for Plowing.—The time for plowing the land to be planted to peanuts will depend somewhat upon its previous treatment. If the land has been in corn the season before and a crop of crimson clover was sown at the time the corn was laid by, it will be desirable to plow the land just before the clover blooms in order to get the greatest benefit from it as a green manure. If the land is in sod it will be desirable to break it during autumn or winter. If there is no crop on the land the plowing need only be done in time for planting, or rather but a short time before planting, in order to allow the soil to settle. Where a crop of crimson clover is turned under, the soil should be thoroughly harrowed and rolled in order to obtain a compact seed bed and to retain moisture.

Depth of Plowing.—The depth of plowing will depend somewhat upon the character and depth of the surface soil. On sandy soils that are underlaid by a clay subsoil, it would be unwise to bring a very great quantity of the subsoil to the surface. If the surface soil is not of sufficient depth, it should be increased by plowing a very little deeper each year until a sufficient depth is reached. As a general rule the depth of plowing for peanuts should not be quite so great as that for corn in the same locality. From five to seven inches of loose soil will be sufficient for the growing of all varieties of peanuts. Subsoiling may prove beneficial on soils having insufficient drainage.

Preparation for Planting.—When the land is plowed but a short time before planting it should be harrowed within a few hours after plowing, in order to prevent loss of moisture. On loose, sandy soils that are reasonably free from weeds or grass it is often possible to dispense with the regular plowing and cut the land with a disk harrow or disk plow.

Where plowing is necessary in order to turn under sod, clover or weeds a tool of this type is desirable for smoothing and pulverizing the soil afterwards. This harrow is superior to the ordinary smoothing harrow in that it turns, crushes and levels the soil in one operation. By means of a lever the cutting blades can be set to any depth, and the weight of a boy or light man upon the seat is sufficient to secure good work. If the soil is very loose it may be necessary to roll or drag thoroughly before planting.

Under ordinary circumstances level culture should be practiced, but where the drainage is poor it may be advisable to throw up slight ridges upon which to plant peanuts; this is especially desirable during a season of excessive rainfall. When ready for planting, the soil should be in the same general condition as that prepared for a crop of snap or bunch beans. Thorough preparation of the soil is profitable for all crops, and especially for peanuts. If the soil can be harrowed once a week for three or four weeks before planting, most of the weeds that would otherwise injure the crop will be destroyed.

FERTILIZERS AND PREPARATORY CROPS.

Cropping System and Green Manures.—Peanuts should be grown in rotation with other crops rather than as a specialty. The cropping system will depend somewhat upon the area of other crops grown, but the arrangement should be such that the land will be planted to peanuts one year in each three or four. A good rotation is corn or cotton the first year with cowpeas planted between rows at the time of the last cultivation; the next season plow under the remains of the cowpeas and plant the land to peanuts; as soon as the peanuts are harvested sow the land with rye and use as a winter pasture; plow under the rye during the springtime and plant cowpeas, using the peas as a hog pasture during the autumn; then return to corn or cotton the following year.

Another plan would be to devote the land one year to sweet potatoes instead of cowpeas, or to a crop of early Irish potatoes followed by cowpeas or crimson clover. In this rotation stable manure should be applied to the crop of corn or cotton, and the commercial fertilizers with the peanut and potato crops. Peanuts should invariably follow some well-cultivated crop which has been kept free from weeds.

The Use of Stable Manure.—Stable or barnyard manure should not be used as a fertilizer the same year that the land is planted to peanuts owing to the great number of weed seeds that are contained in the manure. The use of manure also has a tendency to cause the plants to produce abnormal tops and a large percentage of poorly filled pods, known to the trade as "saps" or "pops." The proper time for applying stable manure is with the crop grown the previous season, thus giving it time to become incorporated with the soil and reduced to the proper condition for the peanut crop.

Commercial Fertilizers.—The peanut responds to the use of commercial fertilizers. However, a reasonable amount of humus in the soil is essential. If properly handled, the peanut crop is not exhaustive of soil fertility; in fact, the plant is a great nitrogen gatherer, as may be observed by the large number of nodules upon the roots. On the other hand, if the entire plant, including the root, is removed and no part returned to the soil the peanut becomes almost as exhaustive of soil fertility as cotton or corn. By feeding the straw and other refuse from the crop to cattle, hogs and work animals and applying the manure thus obtained to the land the fertility may be retained or even increased.

On soils that are adapted to the production of peanuts it will not be necessary to employ commercial fertilizers in large quantities. Soils abundantly supplied with nitrogenous matter will, especially during a rainy season, produce an overgrowth of vine and poorly filled pods.

A commercial fertilizer adapted to the production of either Irish or sweet potatoes is as a rule suited for the growing of peanuts. A mixture which contains from two to four per cent. of available nitrogen, five to seven per cent. of available phosphoric acid, and six to ten per cent. of potash is desirable; this should be applied at the rate of from 200 to 1,000 pounds to the acre, according to the needs of the land. Most growers follow the practice of scattering the fertilizer in a narrow strip where the row is to be planted, but for the general good of the land it is a better plan to sow or drill the fertilizer broadcast. In all cases it is important that the fertilizer be thoroughly mixed with the soil.

Importance of Lime in the Soil.—In order to insure the proper filling and ripening of the pods, peanuts require an abundance of lime in the soil. Where the soil is of a calcareous nature, containing limestone, shells or lime in its more active form, it may not be necessary to make a regular application, but on soils that are deficient in lime or inclined to be in the least sour, from 1,000 to 2,000 pounds of fresh-burned lime should be applied to an acre every four or five years. The lime should not be put on at the same time as the commercial fertilizers, but rather during the previous autumn, or at the time of plowing the land. Wood ashes are desirable as a fertilizer for peanuts, as they contain both potash and lime. Unleached wood ashes may be applied broadcast at the rate of 1,000 to 2,000 pounds, twenty-five to thirty bushels, to the acre.

The presence on the land of certain weeds, such as the common sorrel and the sedges (which have three-cornered stems), indicates sourness and insufficient drainage; to correct this an application of lime will be necessary in addition to ditching or tile-draining. Lime should be used on land that is to be planted to peanuts, unless it is definitely known that there is an abundance of it already present.

The Peanut as a Nitrogen Gatherer.—The peanut plant, in common with other leguminous plants, has the power of collecting the free nitrogen of the atmosphere and storing it in little nodules upon its roots. For this reason the peanut is one of the more desirable of our soil-renovating and soil-improving plants. It should be borne in mind, however, that in order to benefit the soil the nitrogen so gathered should not be removed, but that the main portion of the roots should be left in the soil.

THE SEED AND ITS SELECTION.

Importance of Planting Good Seed.—A good grade of seed is just as important with the peanut as with corn, wheat or any other crop. There is perhaps no other farm crop except corn that is so greatly influenced by the character of seed planted as the peanut. The very best peanuts of the previous season's crop should be selected for seed, and of these only the most mature and perfect peas should be used. Seed should be saved only from well ripened and mature plants and should be properly cured and kept dry during the winter months. Good seed produces a more even stand of plants, which in itself returns a greater yield.

Improvement by Selection.—The seed should not only be selected from plants that are mature, but from those producing a large number of mature pods as well. By doubling the number of well-filled pods on each plant the yield for each acre will also be doubled. Many millions of bushels have been added to the corn crop of the country simply through the selection and improvement of seed.

What has been done with corn is possible with the peanut, and where we now have an average yield of thirty-four bushels to the acre, it is reasonable to expect this to be increased to fifty or sixty bushels through seed and cultural improvements.

Planting Shelled or Whole Seed.—In planting the large-pod varieties it is desirable for several reasons that the seed be shelled. In the first place the planting machines now in general use are adapted to handling the shelled seed only. Second, when planting whole pods there is always doubt regarding their being well-filled, and a poor stand may result. Third, pods containing two or more seeds will produce more than one plant in a hill, causing a waste of seed and a crowding together of the plants. Fourth, whole seed is slower in germinating than shelled seed. With the Spanish variety the case is quite different, as several of the machines will handle the whole nuts, the pods are invariably filled, the crowding together of the plants is no great disadvantage, and the few days extra time required for germination is of little consequence.

Virginia nuts intended for seed should always be shelled by hand, but the Spanish are sometimes shelled by machinery, although their germination is invariably injured when so handled. Many growers of the Spanish peanut practice soaking the unshelled nuts in water pre-

Picking Peanuts.

vious to planting. Soaking for a few hours will hasten germination, but if for any reason the seed can not be planted immediately it will be lost. Shelled seed should never be soaked before planting.

TIME AND METHODS OF PLANTING.

The time for planting peanuts is in the spring after the soil has become thoroughly warm. In order to secure a good stand, the seed should not be put in the ground until there is sufficient warmth to germinate it quickly. As a rule peanuts should be planted a trifle later than corn and beans. The Spanish variety may be planted somewhat later than the Virginia type, as it requires less time to complete its growth.

Distance to Plant.—A common distance between rows is thirty-six inches, but this varies somewhat according to the soil and variety. For the Virginia Runner variety on good soil the distance between rows should be at least thirty-six inches, and twelve inches between the plants in the rows. Virginia Bunch peanuts may be in rows as close together as thirty inches, and seven to nine inches apart in the rows. The Spanish and Tennessee Red varieties are planted in rows from twenty-eight to thirty-six inches apart and seven to nine inches apart in the rows, according to the fertility of the soil. On rich soils, where the spread of vine will be great, the maximum distance between rows as well as between plants in the row should be allowed.

Quantity of Seed Required.—The quantity of seed peanuts required to plant an acre will depend somewhat upon the distances of planting. As a rule one-half bushel of shelled Virginia peas will plant an acre. One and one-half pecks of shelled Spanish peanuts, or two bushels in the pods, are required for an acre. The greater the care exercised in planting, the smaller will be the waste of seed, and economy is quite an object when planting specially selected or high-priced seed.

Depth to Cover the Seed.—The depth to which the seed should be covered will depend somewhat upon the character of the soil. On heavy soils three-fourths inch to one and one-fourth inches will be sufficient, while on light, sandy soils one and one-half to two inches may not be too deep.

Tools and Methods of Planting.—Peanuts are generally planted in rows that are cultivated in one direction only. Some growers follow the practice of first marking the land with an implement similar to the ordinary corn-marker. Others open a furrow with a one-horse plow, then after the fertilizer has been distributed in the furrow the plow is again used and a slight ridge thrown up. There is now on the market an implement which sows the fertilizer, throws up a slight ridge, and at the same time indicates the position of the next row. If desired, this machine can be supplied with a seeding device which will complete the planting at one operation.

The greater portion of the peanut crop of the present day is planted with one-horse planters. These machines are similar in many respects to a cotton planter; in fact, a cotton planter may be adapted to planting either the whole Spanish or the shelled Virginia peanuts with very little trouble or expense. The ordinary peanut planter costs in the neighborhood of $15.00 in most localities.

GENERAL CULTIVATION.

Method of Cultivation.—Cultivation of the peanut crop should begin as soon as the rows can be followed and continue until the vines begin to occupy the ground. The work of cultivation should be pursued very much the same as for corn, beans and all similar crops. Frequent shallow cultivation that will keep the soil loose and prevent the loss of moisture is essential. Shortly after rains the surface soil should be stirred and during dry weather a dust mulch maintained. After the first cultivation it will be desirable to work the soil toward the rows to provide a bed of loose earth in which the pods may form.

After the peanuts begin to "peg," or form pods, they should not be disturbed or given further cultivation. The old idea that the blossoms of the peanut must be covered is erroneous, although growers frequently allow considerable soil to be thrown over the vines during the final cultivation. For the last cultivation it is a common practice to employ a tool that will both throw the soil toward the rows and leave a furrow in the middle of the alley to carry off water during heavy rains.

Common crab grass is one of the most troublesome weeds of the peanut fields and it is often necessary to resort to hand-hoeing in order to keep this and other weeds out of the rows. If the crop is kept well worked with horse tools, very little hand labor will be required.

Tools Adapted to Cultivating Peanuts.—Most implements that are adapted to the cultivation of corn or cotton will be found suitable for handling the peanut crop. For the first two or three cultivations a spring-tooth riding cultivator is desirable, while for the later workings the same implement can be used by changing the spring teeth for regular cultivator shovels. For one-horse cultivation the ordinary cotton sweep is frequently used, but later forms of cultivators will do more efficient work. This implement is provided with several styles of narrow and broad shovels, sweeps and hillers, making it adaptable to a great many changes and suited to a wide range of conditions.

Some growers follow the practice of running a light roller over the plants after the final cultivation, the object being to flatten the stems upon the ground in order that the little pods forming on the extremities of the stems may reach the soil. This practice may increase the yield, but it will also increase the percentage of "saps," or unfilled pods, and it is doubtful if anything is gained by the practice.

HARVESTING.

Proper Time for Digging the Crop.—No fixed rule can be given by which to determine when to remove the peanut crop from the ground, and each grower must be his own judge in the matter. In general practice the growers aim to dig before the first frosts, in order that the peanut vines may have greater value for stock food. To the southward, where frosts do not appear until quite late, the vines assume a yellowish appearance during the latter part of the season, which indicates the ripening of the peas. If digging is deferred too long the first-formed peas are likely to burst their shells and start growing; this is especially true if there is a period of rainy weather late in the season. The aim should be to dig at the time the vines have upon them the greatest number of mature peas. Where a large acreage is grown it will be necessary to begin harvesting as soon as the earliest peas are ready, in order to complete the work before unfavorable weather sets in.

CONCLUSIONS.

The peanut is worthy of more general cultivation throughout the Southern States, especially in the boll-weevil district, where it will in many cases be found more profitable than cotton.

The uses of peanuts as a general farm crop throughout the Southern States are becoming more numerous, especially as a means of providing suitable forage for range stock during the short winter period.

The demand for peanuts to be used in the preparation of human food is constantly increasing.

The United States is a heavy buyer of peanut oil that is produced abroad, while there are thousands of acres of waste lands in the Southern States that would produce enough peanuts to keep the cotton-seed-oil mills running and furnish more than enough oil for home consumption.

The peanut is a soil-builder and renovator. If included in the crop rotation and properly handled, peanuts are not exhaustive of soil fertlilty.

While the average yield of peanuts is only about thirty-four bushels an acre, with proper methods a yield of sixty bushels of peas and one to one and one-half tons of forage may reasonably be expected. There are authentic records of yields of 160 bushels of Spanish peas, together with two tons of forage, per acre.

The peanut vines, after the removal of all the first-class peas, have a feeding value practically equal to the cost of the field culture of the crop. An acre of first-class peanuts, calculating the yield at a ton of vines, worth from eight to ten dollars, and sixty bushels of peas, worth from forty to sixty dollars, will give an income of from forty-eight to seventy dollars. The cost of growing an acre of peanuts is variously estimated at from twelve to twenty-five dollars, including seed and fertilizers. These figures show a net return of from thirty-six to forty-five dollars, which is above the average for the crop as now grown in the United States, but decidedly lower than may be expected under favorable conditions and proper cultural methods.—*United States Bulletin 356.*

RUNNING WATER IN THE COUNTRY HOME.

Nothing is more conducive to good health than plenty of good, fresh water for immediate use in the farmer's home. The last census states that the death rate in the country is greater than in the cities. This is largely attributed to impure water in the country home. The wells are improperly protected from contamination by surface water. The wells and springs should be well cemented to keep out everything that will pollute the water supply.

It is important to have plenty of fresh, pure water for family use in the most convenient manner. Water that is convenient saves the housewife many tiresome steps in these days of scarce labor in the house.

I am sure that no great part of this paper should be given to a discussion of the desirability of having a supply of running water in the country home because our country women as a rule recognize the great importance of this matter. If I were addressing an audience made up of farmers, I think I should dwell strongly upon this phase of the question, for if there is any one thing in which we as farmers are deficient it is in the full appreciation of the importance of making our farm houses more comfortable and convenient. I place myself in this class because it has only been in recent years that I have come to anything like a true appreciation of the great necessity for making the work of country women lighter. I have seen my own mother practically wear her life away at tasks which a little thought would have made infinitely less burdensome. It seemed to be only a matter of course. Other country women did the same things, and it did not enter the minds af the men about the house that anything should or could be done to make this labor lighter.

My father was the typical busy farmer, with too many cares of his own to give much thought to matters about the house, while the boys had their own share of work in the fields. The result was that the women folks ran the house as best they could, and my mother, with the patience and self-sacrifice so characteristic of country women, worked from morning till night at tasks often too heavy for her strength.

Pardon this personal introduction. I give it merely to show that I am not unfamiliar with the condition that exists in the average farm home and to place myself in that class of thoughtless farmers who through a mere matter of custom in most instances, coupled with the negligence born partially of short-sighted economy, allow conditions to exist around the country home which are not only unnecessary but which are really very poor business policy.

I, however, do not care to censure the farmer without at least saying a word in his justification in this matter. We must remember that most of us are what we are largely because of certain long-continued lines of training. We have certain points of view because we have been reared under such and such an environment. We think as others think. We do as other folks do. The different activities of which our lives are made up take the form of habits. In the case of the farmer, therefore, he has been raised under conditions which have never led him to think but that the average condition in the home is perfectly right, and it is only the exceptional man, the man of uncommon originality, of wider experience, or of great education, who will do differently unless his wife requires it. And too often our country women, either through self-sacrifice or frequently through failure to see the importance of greater comforts and conveniences themselves, fail to bring about needed changes.

In my opinion one of the very first essentials to comfort and convenience in the farm home, next to a proper plan (which by the way, is far too often left to the country carpenter), is the presence of running water. The carrying of water from well or cistern, sometimes remotely located from the kitchen door and too often provided with a pump that "runs down" between trips, or even with a rope and bucket, is too well known to need attention. If some farmers would stop to calculate the number of miles their wives or daughters walk during a year carrying water, often through rain or over ice-covered walks, he would secure a result which would go a long way toward awakening him from the lethargy in which he lives.

One of the most important considerations in supplying water for the farm home is the character of the water supply. The cistern may be perfectly satisfactory if precautions are taken to prevent surface water entering, and a solid cement wall should always be provided to insure pure water. The ordinary dug well may also be satisfactory, but such a well is always questionable. Typhoid and other bacteria may gain entrance through the surface water and instances are all too numerous where this has occurred and the water still have every appearance of wholesomeness. This can usually be prevented by tightly cementing the top ten feet with cement during a dry time, but even with this protection a driven well is always to be preferred.

Where water is secured from a spring or stream there is always a possibility of contamination, although in the case of a good spring the danger is small. Many instances are on record, however, where springs have been the cause of severe typhoid epidemics, and the common idea that spring water is always pure is erroneous. Too great care cannot be taken in obtaining pure water, therefore, and there is no surer way than to provide a good, driven well in which the supply comes from depths of forty feet or over. Because for years we may have used water from some particular dug well without a case of typhoid is no assurance that it will never come. A visitor at the home, who has only recently recovered from this disease, may furnish a pollution for a dug well that has always been perfectly pure. The result may be a loss for which no amount of money or subsequent care can ever atone. Country people are far too careless about the character of the water supply.

Naturally the first thing that appeals to the average farmer when he once comes to consider the matter of installing water in the house is that of expense. And this is justifiable; for in spite of all the editorials in which our optimistic newspaper and magazine editors indulge, the average farmer must usually be mindful of this phase of the question. But it does not necessarily mean an expensive plant to give a great many of the conveniences offered, and in this connection I wish to call attention to probably the simplest plan of bringing water to the kitchen.

This plan consists simply of the installation of a sink at a convenient place near the kitchen table, if possible, on which is mounted a common pitcher pump connected with the well and cistern by iron pipes. Where both hard and soft water are desired, two pumps can be installed, one connecting with the well, the other with the cistern. In this case two sinks are usually installed, although it is perfectly feasible to use a single sink and pump with a cut-off which can be turned instantly to connect with well or cistern as desired. The waste-pipe from the sink should be of lead, an inch and a-half inside, and should connect with a three or four-inch tile running to the nearest outlet. It is desirable for sanitary purposes to place the ordinary small trap beneath the sink and to use glazed sewer pipe with cemented joints for the first fifty or one hundred feet to avoid any possible contamination of the well. White porcelain sinks are available at every plumber's shop, or they may be ordered of various companies handling plumbing goods. They are very

Our Exhibit at the Last State Fair where Lectures on Growing Alfalfa in Virginia were Delivered Daily.

much to be preferred to other kinds. If the edges are rounded in a wide roll this adds much to their appearance and aids in keeping them clean. Such a plan can be worked out with perfect satisfaction on most farms at an expense approximating $40.00. The supply pipe used should be the one and one-fourth inch size, and, if the distance from well or cistern to the sink is over thirty feet, a force pump should be used instead of the pitcher pump. A pitcher pump is worth $6.75, a twenty by thirty-inch white enamel sink, $6.00, a force pump, $12.00, the small lead trap beneath sink, $1.75, lead piping is worth forty-five cents per foot, and the one-and-one-quarter-inch iron piping, fifteen cents per foot, cut ready for installing.

The more convenient method of supplying water in the farm house is the common plan of a supply tank from which water is conducted by pipes to faucets located wherever desired. This plan usually necessitates considerably greater expense but it offers many more conveniences, among them the installation of a bath tub and closet. Supply tanks for this purpose are of two general types, the elevated tank and the pressure tank. In the elevated tank the water is raised either by hand or by convenient power, such as a wind mill, a gas engine, a hot air engine or in some very fortunate locations by a hydraulic ram. It is not necessary to enter into a discussion of these sources of power here, except to say that the hand-pump is usually the cheaper and the windmill the most common. Gas or hot air engines require considerable attention and the hydraulic ram is possible only in locations where there is a stream with a considerable flow of water which has a fall of several feet.

Elevated tanks may either be located in the attic of the house, or on a tower several feet above the faucet outlets. The attic tank is usually the cheaper and is in less danger from frost. It also offers opportunity for cheaper plans of installing pipes than in the case of the tower tank.

A simple form of installation is an attic tank into which water is pumped by hand. Such a plan answers very well for the kitchen supply of either hard of soft water, and ten to twenty minutes pumping each day will maintain a supply sufficient for the ordinary family where a suitable force pump is installed. This pump may be installed at the well or cistern, or in the kitchen, and a cut-off can be so arranged that water may be pumped either into the tank or for immediate use as desired. Such a plan would not give sufficient water to supply a bath room with closet, without the pumping becoming rather irksome, but it answers very well for a kitchen supply, also for a bath-tub supply. A precaution to be observed is to be sure that the strength of the construction of the house is sufficient to carry the weight of the tank when filled. It may be necessary to put in extra timbers.

The cost of such a plant where the well or cistern is located within thirty feet of the house would vary from $150.00 to $175.00. These figures allow two sinks, one in the kitchen and one in the basement, and provide for a bath tub with hot and cold water as well as for the necessary pump, piping and drain. They do not provide for a closet in the bath room.

Where attic tanks are used they may either be lined with lead, or a galvanized tank is very satisfactory if it can be gotten in place. Lead-lining is dangerous for tanks used for drinking or cooking water, but very good for rain water if used only for washing purpose. Lead is more soluble in soft rain water than in hard waters, so that care must be exercised in its use. Where galvanized tanks are used they should be set in a galvanized iron or lead-lined trough to catch the condensed water that runs down the outside and which would otherwise cause damage to the ceilings of rooms below.

It is possible to run rain water from the roof directly into a tank in the basement from which it can be pumped to a tank in the attic with a hand-pump where the family is not large. Such a system has been tried in many instances with excellent results.

Another plan for using roof water, which is more satisfactory in many cases, is to provide a tank in a small room of the second floor of the house into which the water is run directly from the roof and distributed by gravity to the rooms below. Such a plan necessitates a cut-off in the supply pipe so that the water may be run either into the tank or outside to the cistern as desired. It is desirable with this plan to install a hand-pump for pumping water from the cistern to this elevated tank during dry periods and it necessitates a tank holding at least twenty barrels to allow of sufficient storage to carry over all but the most prolonged dry periods. The house must be well built in order to sustain this weight. In all tanks installed within the house it is necessary to provide an overflow pipe to insure safety. This overflow may either lead to the drain or to a place where it may be used for watering or for further storage.

The most common type of water supply is that of an elevated tank supplied with a windmill. The tank is either elevated on a tower or in a building, and connected directly with the faucets and bath room as well as with watering troughs at the barn and in the lots. Such a system is in general the most practical where a large amount of water is desired. It has the disadvantages of danger from frozen pipes, of occasional water shortage when there is no wind, and of a considerable expense, although under average conditions it is one of the cheapest forms for the water supplied. It has the advantage of capacity, of requiring little attention and of a moderate cost for the water provided. Such a system will cost approximately $250.00 for windmill, piping, bath-room fixtures, tank, pump, drain and labor where the well is within 100 feet of the house. Attention is called to the desirability of using a galvanized iron tank rather than a wooden one, the latter being very difficult to keep from leaking.

The second general type of water supply is through a compressed air tank. There are various means of arranging such a system, but the general plan is to have an air-tight tank, ordinarily of steel, located at a convenient place, usually in the basement or underground, into which the water is pumped against a cushion of air, the pressure of air raising the water to the desired height in the house. The tank is usually provided with an air-pump for regulating the pressure or the amount of air contained. A pressure of ten pounds per square inch will raise water twenty-two feet, and a fifteen-pound pressure, thirty-three feet.

The pumping power for a pressure-tank may be either a windmill, a gas-engine or a hot-air engine. An automatic regulator is usually provided which stops the pump when a desired pressure is reached.

The cost of such a system varies considerably with the size of the tank, with the kind of power used, and with the general plan, but it is usually from $50.00 to $75.00 more expensive than the elevated tank.

Such a system has many advantages in that water is supplied in large quantities wherever needed, it gives adequate fire protection, and where the tank is located in the basement there is little danger of freezing. It has the disadvantage of necessitating slightly greater expense in its installation, but it is by far the most satisfactory under average conditions.

In installing a complete system of water in the house one can figure the bath tub at a cost of about $22.00, the hot water heater at $8.50, the closet at $16.00, the vent from soil pipe to the roof at $6.00, single traps at $1.75, grease trap under the kitchen sink at $3.25, one-and-one-quarter-inch galvanized iron pipe at fifteen cents per foot, cut to proper lengths, one-and-one-quarter-inch lead pipe at forty-five cents a foot, and kitchen sinks at $6.00 apiece. The cost of labor on a complete system will vary from $40.00 to $60.00. Where the air-pressure tank is installed one can figure a twenty-barrel size as worth $40.00, and a ten-barrel size as worth $30.00, while an air-pump will cost $7.50.

A new plan of air-pressure supply is what is known as the Perry system. This system locates the air-tank convenient to the power, and the engine or windmill simply compresses the air in this tank which is connected by pipes with a specially-designed, automatic pump in the well worked by the compressed air which forces fresh water from the well wherever needed. This pump operates only when water is drawn from a faucet, maintaining a constant pressure.

Under most conditions some form of the compressed air system is the most desirable if funds are available for installing it. The fact that it gives sufficient pressure to furnish considerable fire protection and that it has the added advantage of allowing the tank to be installed within the cellar or within a building where freezing can be prevented is of much importance. Where the same gas engine that runs the pump is also used for other purposes the expense of its installation is not much in excess of the ordinary windmill and tower-tank method.

As to the details of installing a water system, there are a number of points that must be kept in mind. In the first place it must be recognized that the installation of anything like a complete system is a complicated matter and requires the knowledge of a competent plumber if the work is to be done properly. To be sure a man who is familiar with plumbing work, and who can secure a set of plumber's tools, may be able to install a satisfactory system himself, but unless he is naturally handy with tools the job will usually be one which will give trouble. For the smaller jobs a man with an ordinary amount of ingenuity and the necessary tools can do the work.

The white enameled bath tub is the most satisfactory form to buy at this time. These are made with a wide-rolled edge in the same manner as the sinks, and are in every way to be preferred to metal-lined tubs.

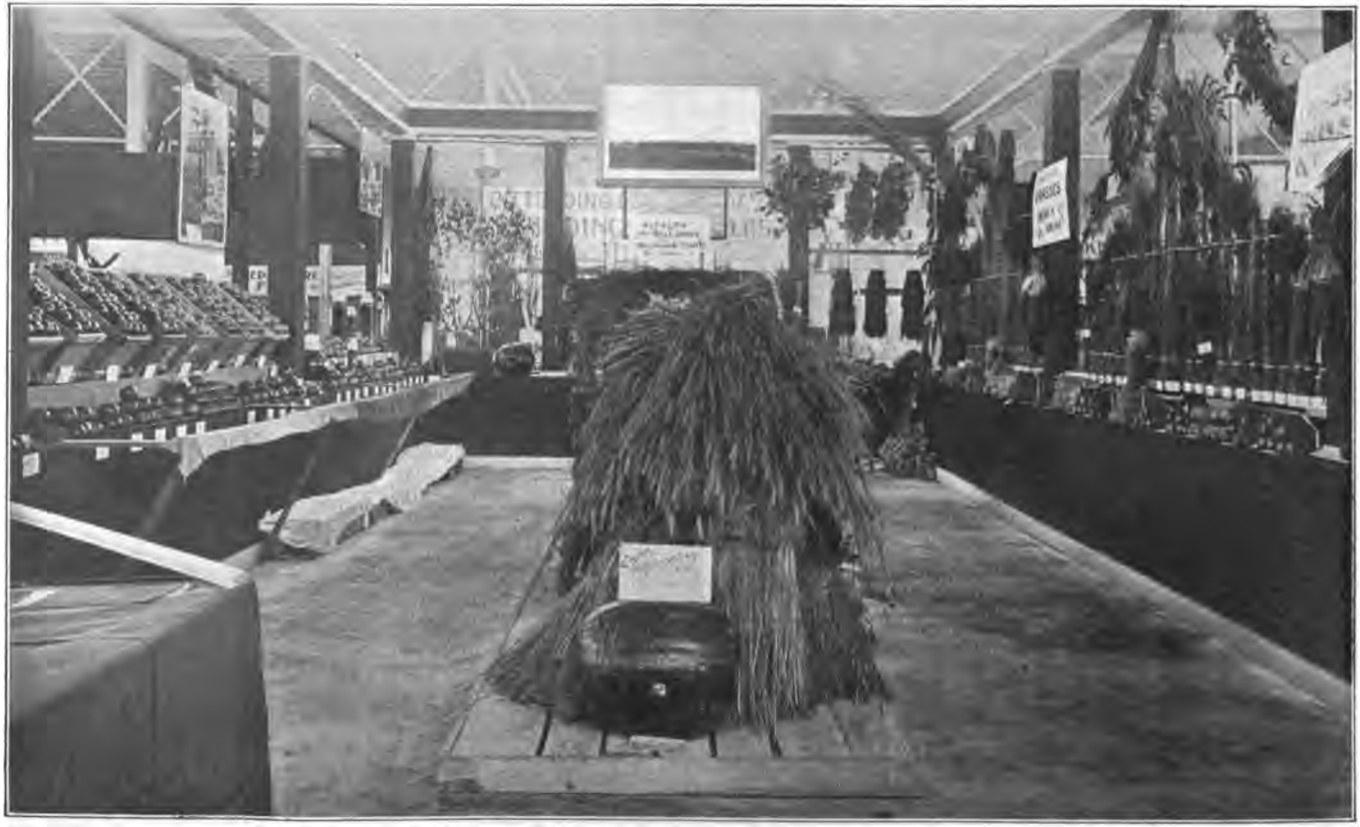


Exhibit at the State Fair of the State Department of Agriculture.

The difference in the cost is insignificant as compared with the greater satisfaction secured from them.

Wash basins, or lavatories, should be of the same material. The old-fashioned marble-slab top is not nearly so good as these modern white enamel steel types and is of equal or greater cost. They can be mounted against the wall or in the corner without the use of brackets which catch dust and dirt.

Where a closet is installed in the house the low-down tank is more noiseless and easier to keep in repair than the higher ones. The ordinary white china siphon type of bowl is satisfactory. The soil pipe from the closet should be of four-inch iron, having joints sealed with oakum and lead. It must connect with the roof by an air vent. Since a closet forms a trap in itself, there is no necessity for a trap in this soil pipe, although it is quite common to insert a large trap where the main drain pipe for the house leaves the cellar.

Shipping Export Cattle Direct from the Blue Grass Pastures, as it can only be done in Virginia.

The matter of sanitary drainage and sewage disposal is a large subject in itself. There are various forms of septic tanks and other complicated devices for handling sewage, but these need be considered usually only in the largest systems. For most houses a four-inch or six-inch glazed sewer pipe into which the drain pipes empty as they leave the cellar is sufficient. This glazed tile should have cemented joints and it should extend for 100 feet or more from the house or beyond all danger of contamination of wells. From this point on the expense may be lessened somewhat by using ordinary red drain tile. The fall of this drain should not be less than one foot in the hundred, and two or three feet would be

Mr. Bellwood Has Bred Up a Fine Dairy Herd of Holstein Cows.

much better. For simple systems, this tile may empty in any convenient low ground where the sewage will be absorbed by the soil. It may, of course, be emptied into a stream, but this is more or less dangerous for people living below. One of the safest systems is to run this sewage onto a sand bed twenty or thirty feet square, provided for the purpose, allowing the material to be absorbed in this bed. It is most satisfactory in larger systems to arrange two beds, using them alternately. Another system is to empty the drain tile into several branches of tile on a lower level, these all running shallow and laid with open joints. If these are laid in sand, so much the better. Whenever sewage is dissipated through loose surface soil the odor is quickly absorbed and, for small systems especially, where a closet is not provided, the opening of the tile in an open drain or in any convenient low ground is sufficient. The main essentials are a tile of sufficient size with a good fall and cemented joints; a convenient area of low land on which the drain may empty. Care must always be taken, however, to preserve the drinking water from any possible contamination from this drain.—*Missouri Report.*

IMPROVE THE COUNTRY HOME GROUNDS.

There is no place like home, and the country home is the best home of all. Why not clean up the grounds; plant shade trees, some shrubs, flowers and vines around the premises and add in some cases a hundred per cent. in the appearance of the home. The cost is a trifle, but the beauty and attractiveness is priceless. We live there and see it all of our lives. What else can we enjoy more at so small a cost?

Of all places the farm home possesses the greatest opportunity for beautiful effects in ornamental planting. As a rule this fact is not sufficiently appreciated. In many cases practically no attention whatever is given to planting about the home. One reason for this frequent neglect is the fact that the owner is under the impression that good landscape gardening about his place can not be effected without elaborate plan and large expense. This is a mistake, for as a matter of fact, it very frequently happens that nature herself has given to the country home all of the main essentials of landscape beauty.

Practically any farmer could make the grounds about his home a thing of beauty with no greater expense than a little effort now and then on the part of his family. The results so obtained in a few years would grow into an effect which would make the farm not only a better place to live, but worth more on the market.

The first essential is to make use of the natural beauty which the place already possesses. The country home is usually surrounded by broad, natural landscape, across which there are beautiful natural views. In many cases almost no planting at all is necessary.

It frequently happens that the main problem lies in the opening up vistas so one can see out over the surrounding landscape. In a wooded country a beautiful view may be opened up by cutting out a few trees in order to allow the eye to range across adjacent valleys or distant hills. Not infrequently a fence row continuously overgrown with trees and bushes may obstruct some beautiful distant scene. An opening cleared in such an obstruction may give a vista through, so as to bring into view from the house, hills, valleys or green pastures which make up the surrounding landscape.

Occasionally the low-growing limbs of a few shade or forest trees may obstruct a view of cultivated fields or green pastures. In such a case it may be desirable to prune off some of these lower limbs in order to open up an attractive scene.

Land which is used for pasture, when cleared, should have occasional groups of shade trees left here and there. This not only gives grateful shade to live stock in the heat of a summer day or shelter from the winds in bleak places, but it makes the surrounding country more beautiful. In selecting these trees to remain standing, valuable species should be considered. Often nut trees are cut down, which, if allowed to stand would supply nuts for the family or even for market. Species like the oak, hickory or black walnut, which contain valuable timber, may be allowed to grow and the older specimens harvested for timber when they have reached full maturity. In one pasture known to the writer, more than $100.00 worth of such timber was taken out in a single year by removing only such mature trees as could be spared without destroying the shade or the landscape effect. If brushy pastures are mowed once or twice a year with a mowing machine their unsightly weeds may be removed and a green blue-grass cover encouraged in place of the unsightly brush. This has an economic value as well, for not infrequently enough more grass can be secured to more than pay for such mowing.

The Cold, Bare, Ugly Fence.

In addition to thus securing views of the broad, surrounding landscape, some individual planting may be done immediately about the buildings. The first thing to do is to clean up the place. This may consist in placing the wood pile in some inconspicuous place in the rear;

gathering together scattered machinery and getting it under protection; defining the drive so the traffic will be confined to a given entrance-way rather than driving promiscuously about the place. In addition to this, inexpensive planting may help to screen away certain unsightly objects, especially in the rear. A back fence behind the place may be covered with vines; the wood pile or chicken house may be sheltered from direct view of the road by massing shrubbery in front of them. A screen of vines may protect the unsightly wood pile from direct view; the feeding lot, or chicken yard, may be screened off by a planting of grape vines which, in addition to their cover as a screen, may furnish fruit for the family.

A main essential is to secure a green-grass lawn before the house. Next to securing good sod, it is essential that the lawn should have an open center. It should never be broken up by scattered and promiscuous flower beds or isolated shrubs. A green, open, sunlit lawn suggests restfulness and quiet, while scattered shrubs or flower beds produce an idea of fidget and distraction.

In placing shade trees it is desirable to use a row of them along the road; others may be grouped in curves of the drive-way or about the borders or in the rear of the home grounds. Enough may be grouped about the house to give necessary shade to hot, sunny porches or south windows. Native forest trees may be used where desired. Fruit trees often may be planted about the poultry runs or feeding lot in order to take away their barrenness and offer inviting shade.

Shrubs should for the most part be massed about the borders of the home grounds, or in the rear. Occasional low masses of them may be placed at the angles of drives or walks.

Vines frequently may be used to good advantage over porches to keep out the hot sun, or as previously described, to screen away back fences or unsightly objects.

For roadways there are probably no better shade trees than the native elm, sugar maple or oak. Native species are already acclimatized and at home, hence they grow well. They are in keeping with our natural surroundings.

Among our native shrubs the dogwood, wild crab apple, various species of hawthorne or thorn tree, silver bells, buckbush, red bud, elderberry or sumac are good. Aside from these native shrubs, if desired, one may employ the old-time lilac, snowballs, syringa, spirea, weigela or hydrangea. Among native vines the trumpet-creeper, five-leaf ivy or Virginia creeper and even wild grapes may be used.

If small, flowering plants are used it is better to plant them at the outer edge of sheltered borders than to put them in isolated beds. The peony, iris, lilies, hyacinths and other perennial forms are desirable and they require but little annual care. One may add to such home plants year by year by bringing in handsome plants from the wild. When one once begins looking for ornamental plants in the woods or along the creek banks, it is surprising how many beautiful species are brought to our notice that had never before held our attention. Planted out about the home where they are removed from their struggle for existence, they take on added beauty so we would hardly recognize them as wild plants. Not infrequently a visitor will ask, "What beautiful shrub is this?" without recognizing it as a wild species which he has tramped over in the woods all of his life time.

All this puts us more in love with the home. It gives us a greater pride in living, and it thereby makes farm life worth the living. It furthermore brings us into a better understanding of and love for our native plants and enriches our capacity of enjoyment of country surroundings.

SOME PRACTICAL DETAILS.

While the foregoing suggestions may be helpful in originating an artistic plan for the home grounds, it is desirable to consider some practical details in carrying out the actual work.

A Few Vines Hide the Ugly Fence and Gives a Fresh Green Row Instead.

Grading the home grounds is one of the first operations, provided the surface is not already in shape for immediate planting. No more grading should be done than is absolutely necessary to accomplish the following two things:

1. Proper drainage away from the buildings, drives and walks.
2. To get a smooth surface that can be mowed.

Ordinarily, around the farm home it is best to leave in the main, the natural contours. It is not necessary to take off all high places or fill in all low ones. Natural slopes are better. Small holes and little knolls, however, should be graded so as to get such a surface that a mowing machine can easily be run over the place.

It is desirable to have the earth high enough about the foundations of the buildings so the water will drain away from them. Roads and walks should be just high enough above their surroundings so they will drain. If not well drained, roads and walks will cut up in wet weather or early in the spring when the frost is going out. However, if good drainage is afforded them, they will generally stand firm at all times of the year.

While natural contours may for the most part be left as they are, it is best to have higher and lower areas join each other in natural, easy lines rather than in sharp angles. A necessary embankment, for example, should not be graded as a sharp angle at the top or join a lower area with a sharp angle at the base. These angles should be rounded off so one contour joins another gradually with an easy slope, so no one can draw a definite line where one area leaves off and another begins.

Grading should never be done when the ground is wet as this puddles the soil so it will be lumpy, hard and crusty. For this reason the autumn is the better time to do the grading. Grading, however, may be done in spring, provided the soil is dry enough.

Where ground is to be graded it is best, wherever possible, to pile up enough of the surface soil so it can be spread over the surface of the bare clay when the grading is finished. If the grading is done in the fall a dressing of fresh, strawy, stable manure should be given throughout the winter to prevent the soil from washing.

Seeding the lawn is best done in early spring. The seed may be sown along with the last snows and allowed to be carried into the soil by the melting snow. It is safest, however, to seed two or three times in a single spring. Dry weather may follow the first seeding and dry out and kill the young grass before it has time to get a start. If three successive sowings are made, moist weather is almost sure to follow some one of them, so the grass will become established before a drought sets in. Seeding that is done after the last snows should be followed by a very light harrowing, raking or brushing of the soil so as barely to cover the lawn-grass seed.

A dressing of fresh, strawy stable manure on spring-sown lawns is helpful. It prevents washing of the soil, keeps the seed from drying out, helps prevent crusting and baking of the soil and furnishes ready plant food for the young grass.

Furthermore, stable manure usually contains much grass seed. Such seed usually germinates very promptly, as the digestive juice of the animals and the compounds in the stable manure fit the seed for prompt germination.

As soon as the grass is well up, the coarse manure may be raked off, leaving the lawn smooth for subsequent mowing. If weeds begin to get the start of the grass the lawn should be mowed at frequent intervals to allow the grass to come through. Furthermore clipping back the grass tends to make it bushy at the roots and makes a compact sod. If the grass is allowed to grow at will the first summer it tends to shade out the roots, form in bunches and give a very uneven sod.

On small lawns it is best to keep the grass mowed with a lawn mower each year. On large lawns it may be mowed only once or twice during the season. Nothing is handsomer for extensive farm grounds than waving blue grass.

Choosing the kind of grass to sow is an important factor. In general there is no better lawn grass than blue grass. It is at home here and reaches beautiful development in most soils. It makes a compact, uniform sod. It will even stand a great deal of tramping when pastured to animals on large areas. It helps to keep down spreading bushes and noxious weeds, once a good sod is secured. Except on lawns that are largely shaded by trees, it is our best lawn grass.

On very shady lawns English rye grass is perhaps the best species. It does well only in shade. It will thrive well in localities too densely shaded by trees for the blue grass. On the north side of buildings where blue grass will not grow, ordinarily, the English rye grass will reach splendid perfection.

On slopes that wash badly, red top is one of the best species to hold the soil in place. It is a coarse, strong grower and will often hold the soil where the blue grass or English rye grass would be entirely washed away. Sometimes it may be grown as a temporary covering when blue grass sowed with it may take its place by naturally crowding out the red top after the sod is established.

Whatever species of grass is to be sowed, it is well to sow some clover seed with it. White clover is the best lawn plant among all the clovers, as it is small, low and compact, lends itself well to frequent mowings, makes a beautiful carpet when in bloom and propagates by runners so it will spread quickly over the bare areas between the plants. White clover seed, however, is very expensive and usually should be used in only limited quantities, except on areas so small that expense need not be taken into account.

Common red clover, especially on large areas, is an excellent nurse plant for lawn grass. Either species of clover sowed with lawn grass is likely to take hold of spots where bare clay is so tenacious that the grasses themselves can not immediately find a foot-hold.

The clovers will in a few seasons mellow and ameliorate even a hard clay so the lawn grasses will eventually come in and take their place. The clovers will make a fair lawn cover on a hard clay soil until they finally prepare the area for the growth of the finer grasses.

In making the lawn, the owner is usually troubled the first year or two with the question of what to do with noxious weeds such as dock, dandelion, etc. For the most part, these weeds will disappear as fast as the soil is well fitted to grow grasses. It may be desirable, however, to dig out here and there the largest docks, burdocks or thistles. In the main, however, the weeds soon give way if the lawn is frequently mowed, and the grass will eventually cover the areas, especially if stable manure is used as a winter dressing until the soil becomes rich enough to support a good growth of grass.

Shade trees may be planted either in fall or spring. In fact, it may be done at any time in the year after the leaves are off in the fall, and before they leave out again in spring, whenever the ground is not frozen, and when the soil is not wet enough to bake, plaster and harden when worked.

If the autumn is excessively dry, so the trees are likely to dry out during fall and winter, it is best to delay planting until spring. Perfectly hardy species, however, if planted as soon as the leaves are off in the fall, will make some root growth and become well established before winter sets in, and be ready for a vigorous growth in spring. Autumn planted trees should be mulched about their roots with straw or manure throughout the winter.

The tendency of beginners is to set such trees too deep in the ground. In very dry sandy soils they may be set a little deeper than they grew in the woods or nursery. In heavy clay loam, however, they should be planted just about the depth at which they grow naturally.

In planting, the tops of the trees should be cut back considerably to balance the cut back root system. In cutting back, it is best generally to leave a central leader or trunk as far as possible. In shortening side branches, it is best to cut back to a side twig, so the part of the limb which is left will be terminated by a growing point.

Evergreen trees, including pine, spruce, fir, cedar and the like, are best, however, transplanted just as they are beginning their new growth in spring. In moving the evergreens, it should be borne in mind that their roots will not stand being exposed to the drying influence of the air even for a few minutes. Small evergreens should have their roots plunged in a tub of water as soon as they are dug up, and kept in water until they are planted in their permanent position.

In setting any kind of trees the earth should be tramped very firmly about the roots as fast as it is shaken in with the shovel. The last inch of soil at the top should be left loose, however, so the soil will not bake about the tree.

Planting ornamental shrubbery is based in each respect upon the same principles as planting ornamental shade trees. This applies to season of planting, method of pruning, handling and all other factors.

Pruning Trees and Shrubs.—As a rule trees and shrubs should be pruned from year to year so as to allow them to take their own natural form or habit. Ordinarily, it is not best to clip trees into low or compact forms by annually clipping them back or shearing the outer surfaces.

Most of the pruning should be done in winter but when the wood is not severely frozen. Dead or dying limbs should be cut out at any time, however. Where it is desired to secure long trunks so one may see out under the trees, the lower limbs may be cut out from year to year as the tree reaches upward in height. Wherever the limb is cut however, it should be cut close to the trunk of the tree so the growing layer may easily close over the wound. If even a short stub or knot is left, this knot will die and the wound can not close over. Wounds will perhaps heal more readily if the limbs are cut just at the time growth is beginning in spring. This gives but a brief period for pruning and where many trees are to be pruned, the work may be done in winter when other farm work is not pressing.

It is not well to remove very much of the leaf surface of the tree by pruning in mid-summer. This stunts the growth of the tree.

Severely cutting back or dehorning rapidly growing trees like the water maple is a mistake. This is frequently done on the supposition that such trees will break down if their limbs are allowed to get long and heavy. However, "breaking down" may be alleviated by shaping the trees from the beginning so it will make a straight, upward, central trunk rather than forming forks. Any tree which has opposite buds like the maple is liable to form forks when the terminal bud at the growing tip dies in winter. Such a fork may be corrected the first winter after it forms, by cutting off one side of the fork, allowing the other side to straighten up and become the leader or main trunk of the tree. If cutting close to the trunk in removing one side of the fork is likely to leave too large a wound, the young stub thus cut may be left from four to six inches long so as to contain a few buds. These buds will push out as side branches rather than replacing the fork.

Cutting back or dehorning a tree tends to make it form objectionable forks from the old stubs which are left. Furthermore, these old stubs will rot more or less, making weak points of attachment where the new limbs form, so that the "breaking down" process will, in the long run, be worse rather than relieved.

How Vines and Shrubbery Improve a Country Home.

Vines to be secured for the home depend upon the character of the house. If the house is of brick or stone, vines may be planted against the base so they will cover the blank area of the walls of the whole house, or as much of it as is desired. It is at least desirable to grow vines about the doorways or at the corners of the house, at the angles, over the outside chimneys, or in large blank areas between the windows.

The best vine for this perhaps is the Virginia creeper, sometimes also known as woodbine or five-leaf ivy, but botanically known in catalogs as Amelopsis quinquefolia. This vine has disc tendrils and clings well to brick or stone walls. It should not be grown on the walls of wooden houses, as it will injure the wood.

The question is often asked whether it will injure stone or brick walls. It is beneficial rather than injurious to brick or stone houses. It shades the walls, keeping the rooms cooler in summer. Chipping of brick or stone is largely due to alternately heating up by the sun and cooling off at night. The shade of the vines prevents this alternate heating and cooling. The roots of vines removes a large quantity of water from the soil around the base of the building, which tends to keep the basement freer from water seepage and opposes uneven settling of the house wall.

The native trumpet creeper is a splendid vine for back fences, or it is a good screen for outbuildings.

For porches the various honeysuckles are among the best. These vines are best trained to wires run vertically along the porch front about one foot apart. Such wires may be attached to screw eyes placed in the frame work of the porch above and below. The mistake is frequently made of using wire screen or fencing on the porch for vines. This prevents reaching through the wire to properly prune the vines. If wires are placed one foot apart, the side branches of the vines will form a sufficiently dense growth across the openings and make a complete cover.—*J. C. Whitten, in Report.*

INSOLUBLE PHOSPHATES

The fertilizing value of fine-ground insoluble phosphates (floats) is attracting considerable attention at the present time. The work of C. E. Thorne, of the Ohio Station; C. G. Hopkins, of the Illinois Station, and H. J. Patterson, of the Maryland Station, especially, has encouraged the hope that under certain conditions the cheaper untreated phosphates may be used with profit, as explained in a previous bulletin of this series. Experiments under other conditions, however, suggest caution in the general application of the results obtained in the above experiments.

For example, experiments made by W. P. Brooks at the Massachusetts Experiment Station have emphasized the fact established by the earlier experiments at the Maine Station that the kind of crop to be grown will often determine whether it is profitable to use the insoluble phosphates.

H. J. Wheeler and G. E. Adams, of the Rhode Island Station, have recently reported experiments extending over a series of years in which floats were compared with a number of other soluble and insoluble phosphates on corn, grass, and a great variety of other crops on limed and unlimed soil, showing a wide variation in the efficiency of the insoluble phosphate under varying conditions of soil, crop, etc.

The floats gave very poor results on corn the first year as compared with the other phosphates. In subsequent years, however, the phosphoric acid of the floats slowly became available and gave good results on both corn and grass. It is probable that in the case of the grass the accumulating organic matter materially aided in rendering the phosphoric acid of the floats assimilable.

In view of the low price of floats and the relatively large amount of phosphoric acid applied in consequence, these results demonstrate that if one begins upon land deficient in assimilable phosphoric acid, even with Indian corn, one should not place too much reliance upon the floats the first year, but should supplement them with some soluble phosphate. In later years they appear to be of marked value in connection with timothy, and especially with redtop and Indian corn.

In case of peas on limed soil floats gave very good results, confirming the general conclusion "that the legumes have, as a rule, a marked ability to acquire phosphoric acid from certain unacidulated mineral phosphates." With "oats, summer squash, crimson clover, Japanese millet (on the unlimed land), golden millet, white-podded Adzuki bean, soy bean, and potato (on the unlimed land) floats [also] gave very good results, but with the flat turnip, table beet, and cabbage they were relatively very inefficient, notwithstanding that much more phosphoric acid had been applied in the floats than in any other of the phosphates."

The results in general indicate that —

Floats can probably be used to best advantage on moist soil rich in decaying vegetable matter, and for such crops as certain legumes, Indian corn, millet, and possibly wheat and oats, which seem far better able to make use of them than certain vegetables. The vegetable growers in the East should not be influenced to use them on account of their reported value on the Illinois black soil of the corn belt, where wheat, grass, clover, and Indian corn are the chief crops, and where the soil conditions are exceptionally favorable to their ready assimilability. Perhaps it may be found that floats can be advantageously mixed with the stable manure which gardeners collect during the winter, but this is a point which needs to be more definitely determined. The fact that phosphoric acid in floats costs less than half what it does in bone makes it most desirable to utilize the former where it can be done to advantage, but the Rhode Island gardener and general farmer will do well to study the foregoing results carefully before employing the floats extensively or depending upon them at the outset, or his bank account may pay the penalty.

The conditions under which these experiments were made in Rhode Island are to a considerable extent representative of those of other parts of the eastern United States where diversified and intensive farming is largely practiced on thin, worn soils. It seems quite clear from the results of all the experiments which have been made under such conditions that (1) the insoluble phosphates are not equally effective on all crops, and hence are not generally well adapted to intensely diversified farming, such as market gardening; (2) they are slower in action than soluble phosphates, and hence not well suited to short-season, quick-growing crops; (3) they do not as a rule, prove very efficient on thin, worn soils deficient in decaying organic matter, and hence if they are to give good results on such soils they must be used in connection with liberal applications of barnyard manure and green manures.—*U. S. Experiment Work.*

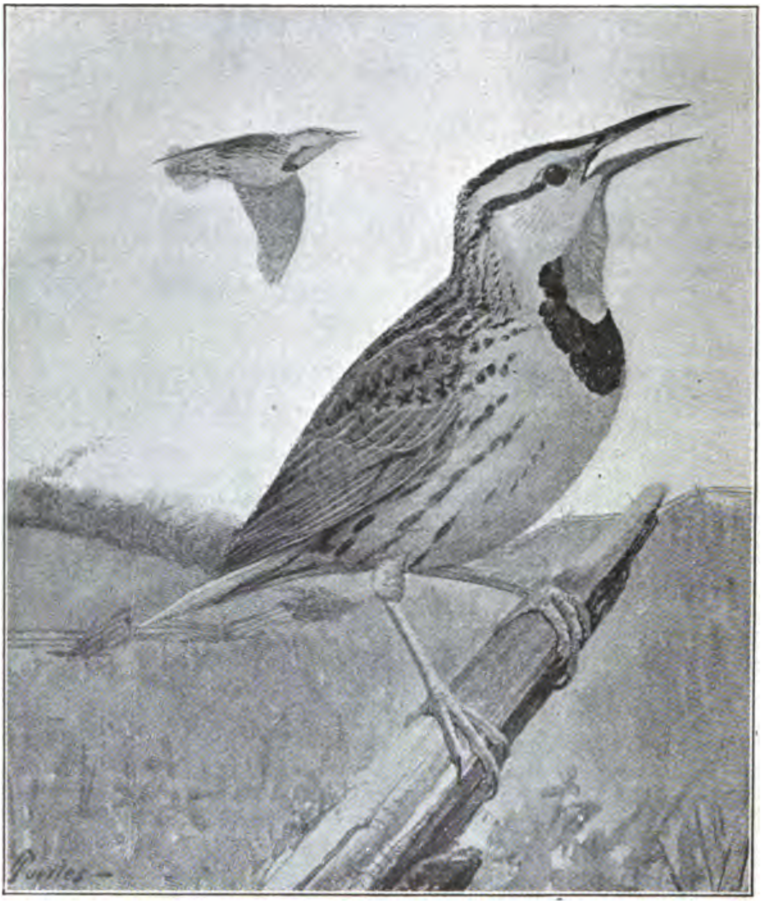
DOES IT PAY?

We know that our rural population love and appreciate birds for the beauty and joy they add to country life. This pleasure, in the majority of cases, however, is entirely unrelated to any sense of indebtedness to them or any sense of responsibility and duty of protection toward them. Very few, indeed, realize a fraction of the economic value of the birds' aid in the farmer's task of feeding the world. Our purpose in this article is to open the eyes of the people a little more to the actual assistance rendered by these indefatigable little workers, knowing that when once they are valued at half their worth we shall have no more trouble in the enforcement of what laws we have now or for the passage of what further laws are necessary for their better protection.

As our naturalists progress in their study of wild life and the minuter details of the means whereby the just balance is kept between production and destruction, we are understanding more and more the importance of the place held by the birds in this process. We would like, therefore, to give a few statistics as concrete examples in proof of the fact that any time, energy or money expended in their study or protection as an actual investment will pay.

A generation ago our fruit trees, without spraying, matured a much greater per cent. of perfect fruit than they do now under the same conditions. At present it is practically impossible to raise any perfect fruit without spraying and otherwise expending much time and money in fighting insect pests in our orchards. What causes the difference? It is due to several conditions. First, by having so much more land under cultivation, so that the birds whose special work it is to keep these insect pests in check have not so much nesting ground as before. Then the increase of population who, not cognizant of their value, have destroyed the birds that might otherwise have remained and nested. And, finally, by the introduction into the country in this cosmopolitan age of fruits, vegetables, grains, shrubs and trees from foreign lands (for we have laid tribute on nearly every land under the sun to supply our ever increasing demand for the best), we have introduced new insect pests as well. These, together with undue increase of those already here, have caused some parts of the country an annual loss of incalculable extent. Virginia has not as yet suffered so greatly from these foreign pests as some other States, but we must not wait to prepare our army until the enemy is overwhelmingly upon us. "In times of peace, prepare for war." However, there is an eternal warfare here and never more than comparative peace, when the birds and the insects form a just balance. In the present instance, our most efficacious soldiers are the birds, and how splendidly they are equipped for this arduous task very few of us have taken time to investigate and find out.

Most birds eat insects. Many eat practically nothing else, and almost all nestlings, even of the grain and fruit eating kinds, are raised on insects because of their greater digestibility. Let us look into the accumu-



Meadow Lark.

lated statistics so patiently and carefully collected by our naturalists and find out if the birds' work really amounts to an appreciable value in this direction.

By carefully watching one individual of a species, we gain a fairly accurate idea of the whole. Here is he actual account of the feeding for four hours and thirty seven minutes of three half-grown brown wrens. The mother began at 5:55 A. M. with a green caterpillar; 5:56 a mayfly; 6:00 another mayfly; and so on at the rate of one every one or two minutes, until in the four and a half hours she had fed them 111 insects and spiders, many of them being most destructive in their nature. As the time counted was barely one third of the day, at the same rate she would have fed them 333 insects in a whole day. This does not take into account those eaten by the two parent birds. As these birds probably nest from two to five times during a season, take your pencil and calculate, if you can, what one pair of these modest little brown birds is worth to a farmer or fruit grower in dollars and cents.

Yearbook U. S. Dept. of Agriculture. 1900 PLATE L.

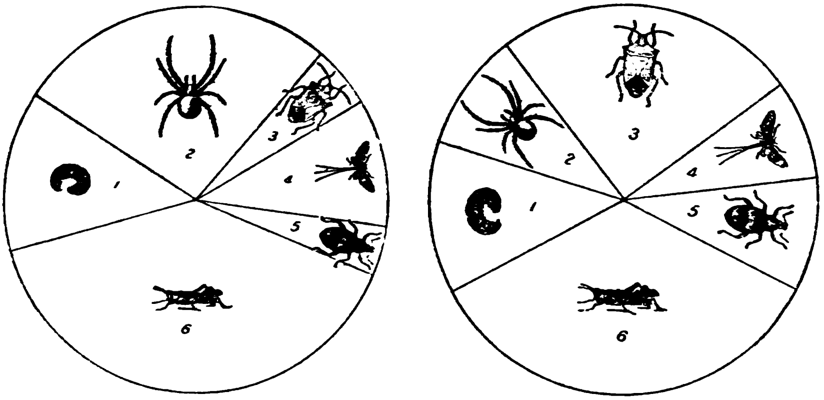


FIG. 1.—HOUSE WREN.

[1. Cutworm ; 2. spider 3. stink-bug ; 4. May-fly . 5. weevil . 6. grasshopper.]

Now let us examine another of our most familiar birds—one we have always appreciated, but not for his most useful quality. We have protected the quail part of the year, only that we might destroy him the other part. Let us investigate carefully and see if he is not too valuable from an economic standpoint to allow his toothsomeness on the table, or the excitement of sport, to tempt us to too much indulgence in the luxury of his destruction.

The Government report says: "It is reasonable to suppose that in the States of Virginia and North Carolina from September 1st to April 30th there are four Bob Whites to every square mile of land, or 354,820 in the two States. The crop of each bird holds half an ounce of seed and is filled twice daily. Since at each of the two daily meals weed-seed constitute at least half the contents of the crop, or one-fourth of an ounce, a half ounce daily is consumed by each bird. On this basis, the total of weed seed in Virginia and North Carolina amounts in the seven months named to 1,341 tons." (P. 14, Bul. 21, Bureau of Biological Survey.) As a weed destroyer, he is ably assisted by the dove, the meadow lark and many other allies.

When the weather opens and insect life is again active he is on the lookout for them and his services in this direction are tremendous. The chinch bug is estimated to cause a loss of $100,000,000.00 each year to the farmers of the United States. This destructive pest invades the wheat fields in armies, but Bob White, with his brood of twelve or fifteen, is there too, and at the rate of two tablespoonfuls for each meal he makes tremendous havoc in their ranks. If there were enough Bob Whites, there would be no chinch bugs left, for his eyes are keen and his appetite good, and even in winter he finds them in their winter quarters under brush piles and in dark overgrown corners and devours them.

He also finds potato bugs to his liking. The writer has had a pair of quail in the garden for several years and has never been troubled at all by these pests, some appearing each spring and then mysteriously dying out. I was at first puzzled by this phenomenon (for they usually make short work of a patch of potatoes when once they appear), until I found the cause to be my little friend, the quail. A quail's crop has been found to contain 100 of these bugs.

He is also an enemy of the cotton-boll weevil.

These are a few concrete examples of the usefulness of our birds. Surely we are not so blind to our own interests as to permit the wanton destruction of that which is so manifestly a valuable asset to our State. What with the swallows patrolling the air, the woodpeckers thoroughly policing the tree trunks and with their bills and long extensible tongues, pulling out all larvae and insects there in hiding, with our warblers and thrushes and titmice and other familiar birds inspecting the leaves and fruit and flowers and buds for insect life and eggs, and with the army of weed seed-eating birds, too, working for us, we are ungrateful indeed if our hearts and our active protection are not enlisted in the cause of these most beautiful and useful of God's wild creatures.—*Mrs. C. H. Harris, President State Audubon Society.*

SPRAYING WITH LIME-SULPHUR, SEASON, 1910.

Tests made by the department to determine the value of lime-sulphur wash on fruit trees. Other reports are due but not received in time for this publication. The department will continue these experiments another year.

MR. G. W. KOINER,
Richmond, Va.:

DEAR SIR: Below I beg to submit a spraying test of sprayed and unsprayed Red Limbertwig apples, which test should be convincing to anyone that spraying pays handsomely. It would have been even better had the spraying begun earlier, or before the buds put forth:

First spraying about April 15.
Second spraying about May 15.
Third spraying about August 1.

First and second sprayings were made with one and one-half gallons of commercial lime-sulphur solution, and its equivalent in home-made, and two pounds of arsenate of lead to fifty gallons of water.

Third spraying was with Bordeaux and two pounds of arsenate of lead, chiefly for Bitter Rot, for which I ought to have sprayed earlier and more times, and should have done so but for the unfavorable season and scarcity of labor.

Commercial lime-sulphur was used on the trees on one side of the unsprayed and home-boiled on the other, and the latter was used for the biggest portion of my orchard.

The home-boiled was made up of four pounds each of lime and sulphur, boiled from forty to fifty minutes. If there is a difference in the effectiveness of the two I am of the opinion that the home-boiled has the advantage, and it is not as expensive; but there being so little difference, I should advise the general small orchardist to purchase the commercial which is less trouble, and since he might not know how to prepare it properly.

It has occurred to me that the foliage of some of my trees was injured by the strength of the home-boiled being too great, but of this I am not sure; yet, it may have been better to have used the self-boiled instead.

Now as to the Limbertwigs: I left one row of unsprayed trees on a public road leading to town and used, as I have said, the commercial lime-sulphur solution on the trees on one side of these, and the home-boiled on those on the other, and for many weeks before gathering time the unsprayed trees dropped most of the leaves, as well as most of the apples, while the foliage on the sprayed remained green, even for sometime after the apples were gathered, about which time also the photographs were made, which was about October 20.

Now there were just as many apples at first on the unsprayed as on the sprayed trees, but they dropped all through the season, and when the apples from two of the sprayed and two of the unsprayed trees were gathered (and I am sorry the photographer failed to get a good negative of the two heaps of sprayed and unsprayed apples) and heaped out side by side, the sprayed measured out eight bushels as against one and one-half of the unsprayed. This is not all: the sprayed apples were larger and smooth, firm nice apples, while the others were wholly defective and knotty to the great extent that you could not find a really first-class commercial apple among them.

The test was seen by scores of passers-by, many of whom say that they will spray the coming season.

Trees Unsprayed in W. H. Clark's Tests for the Department of Agriculture.

The approximate cost of spraying my entire orchard of about 1,000 trees, which average about the size of the ones photographed, was per each time as follows:

72 pounds sulphur, at 3 cents	$ 2 16
72 pounds lime, at 1-2 cent	36
36 pounds arsenate lead, at 10 cents	3 60
3 men, 3 days each, at $1.00	9 00
1 horse and wagon, 3 days, at $1.50	4 50
Total	$19 62

I want to say in conclusion that my calculation is that my orchard netted me at least $400.00 to $500.00 more than it would have done had I not sprayed, and if it had been taken in hand earlier, and a few more sprayings administered, one before budding and at least two others for Bitter Rot, the results would have been a vast deal better still.

Trees Sprayed in W. H. Clark's Tests for the Department of Agriculture.

The apples were improved so very much that it was noticeable at a glance by apple buyers and old orchardists, and I have voucher for some premiums on some sent the Virginia State Fair.

Yours very truly, W. H. CLARK.

TEST MADE BY H. C. MILLER IN ALBEMARLE COUNTY, SPRING 1910.

Just as the bloom had fallen, I made an application of lime-sulphur solution and used one and one-half (1½) gallons of lime-sulphur stock solution in fifty gallons of water, adding two pounds of arsenate of lead. Owing to the pressure of work only had time to make one application. The results were beyond anything I could have a right to expect. Without this application of lime-sulphur the apples would not have been worth gathering or even picking up. As a proof of this fact I made a special test on eight trees, sprayed four and left four unsprayed. The four sprayed trees yielded seven barrels of fine merchantable apples; the four unsprayed trees combined only yielded one-half bushel of indifferent fruit; the rest, wormy and knotty, had fallen on the ground as well as the leaves. The foliage on the sprayed trees was green until frost came. This was such a striking test of the value of spraying that I shall always, in the future, spray my fruit trees as I realize that orcharding is a failure unless the trees are sprayed. I did the work with a $10.00 spraying machine set in a coal oil barrel. In all, I sprayed about 250 trees. This machine is ample for orchards of this size and under.

Summary.

A neglected orchard of winesaps.

Fruit too indifferent to gather heretofore.

Trees sprayed yielded on the average two barrels of nice, merchantable apples per tree.

Four unsprayed trees only produced a gallon of small, indifferent apples each, and trees defoliated.

TEST MADE IN JNO. B. SNEAD'S RAPPAHANNOCK COUNTY ORCHARD AND NEIGHBORING ORCHARD

Application of spray consisting of one and one-half gallons of lime and sulphur solution and two pounds of arsenate of lead to fifty gallons of water made April 18, 1910, blossoms having just dropped. In this test forty York Imperials nine years old—thirty-three received this spray and seven left unsprayed. Thirty-three trees sprayed produced seventy per cent. first-class apples; seven trees unsprayed produced from twenty to twenty-five per cent. first-class fruit.

In another orchard, thirty trees sprayed three times. First application of Bordeaux mixture with two pounds of arsenate of lead was made as soon as blossoms dropped. Second spray consisted of one and one-half gallons of lime-sulphur solution, two pounds of arsenate of lead to fifty gallons of water, made two weeks later.

Third application, consisting of one and one-half gallons of lime and sulphur solution and two pounds of arsenate of lead to fifty gallons of water, made three weeks after second spraying. The rest of this orchard was sprayed with Bordeaux mixture and arsenate of lead. Twenty-five trees in this orchard left unsprayed. Trees receiving three applications of spray produced eighty per cent. of first-class fruit. Only difference noted between trees receiving Bordeaux mixture and trees receiving lime and sulphur solution was: trees receiving lime and sulphur solution produced fruit more highly colored and smoother, and foliage on tree sprayed with lime and sulphur solution kept in better condition during summer.

Twenty-five trees receiving no spray produced fifteen per cent. first-class apples. Age of trees in this orchard, eleven years.

THE PERIODICAL CICADA OR 17-YEAR LOCUST.

There are two broods of locusts that appear in Virginia: the seventeen-year and the thirteen-year families.

The seventeen-year race visits every section of the State except the counties of Brunswick, Halifax, Hanover and Prince George, which are annoyed every thirteen years by these pests known as the thirteen-year race.

Brood No. 1 of the seventeen-year family was scheduled to arrive in 1910 in the following territory, but as the season is past, the scientist is a little puzzled. This 1910 brood was to appear in the district from Petersburg and Dinwiddie county to the southern line of the State; also in Bedford, King William, New Kent and Rockbridge counties and in the Valley from the Potomac to the Tennessee and North Carolina lines.

Brood No. 2, seventeen-year locust, is expected the latter part of May, 1911, in the counties of Albemarle, Alexandria, Amherst, Appomattox, Bedford, Buckingham, Campbell, Caroline, Charlotte, Culpeper, Fairfax, Fauquier, Fluvanna, Goochland, Hanover, Henrico, James City, Loudoun, Louisa, Lunenburg, Madison, Page, Pittsylvania, Powhatan, Prince Edward, Rappahannock, Spotsylvania and Stafford.

The appearance of the locust often causes concern and alarm as to possible injuries to vegetation and fruit. The actual damage is, as a rule, slight. Some anxiety is felt by many persons as to the sting or bite of this insect, but the experience and records of the past show them to be harmless.

ANIMAL AILMENTS

Animal ailments constitute one of the very large channels of loss upon the stock farms, and judging from the enormous sale of proprietary stock foods, which are really used as preventive medicines, the fear of disease is as heavy a burden as the diseases themselves.

Not all ailments are preventable, but the loss from them can be greatly reduced by rational treatment and a clear understanding of the nature of the various kinds of ailments would almost completely save the millions now expended for the proprietary stock foods.

Sickness has remained a vague mystery in the minds of men longer than any other natural phenomenon, with the result that the present generation does more wholly irrational things in the name of doctoring than in any other field of activity.

The first step toward relief of domestic animals from the torturing they now undergo in the name of doctoring, and the saving of enormous expenditure for proprietary stock foods, is to remove the vague thought that disease is a mysterious thing and more or less a matter of chance.

When men clearly realize that disease is no more mysterious than weed in a cornfield they will save their animals much suffering and themselves much expense. I recall the childhood myth that the snarls in the manes of colts were put there by witches for stirrups. As fantastic